IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Reissue Application of:	Bill L. Davis and Jesse S. Williamson
Entitled:	COMBINED LITHOGRAPHIC/FLEXOGRAPHIC PRINTING APPARATUS AND PROCESS
For:	Reissue of U.S. Patent 5,630,363
Filed:	May 20, 1999
Serial No.:	09/315,796
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Group Art Unit:	2854

SUPPLEMENTAL STATEMENT OF PRIOR ART AND OTHER INFORMATION

APPENDIX 1

I. Documents Pertinent to Series Commencing with UnitedStates Serial No. 08/435,798 filed May 4, 1995

Index No.	Description
1	European Patent Application No. EP 0741 025 A3 entitled: Retractable Inking /Coating Apparatus having Ferris Movement between Printing Units Applicant: Howard W. DeMoore; Inventors: Howard W. DeMoore, Ronald M. Rendleman and John W. Bird; Filed: May 5, 1993; Date of Publication A2: November 6, 1996
2	U.S. Patent No. 4,841,903 entitled: Coating and Printing Apparatus Including An Interstation Dryer, Issued on June 27, 1989 to John W. Bird, Assignee: Birow, Inc.
3	U.S. Patent No. 5,107,790 entitled: Two Headed Coater, Issued on April 28, 1992 to Larry J. Sliker and Robert S. Conklin, Assignee: Rapidac Machine Corp.
4	U.S. Patent No. 5,335,596 entitled: Coating Apparatus for Sheet-Fed, Offset Rotary Printing Presses, Issued on August 9, 1994 to Howard W. DeMoore and Steven M. Person, Assignee: Howard W. DeMoore

Index No.	Description
5	U.S. Patent No. 4,617,865 entitled: Liquid Coater for a Printing Press with Moveable Inking Roller and Tray, Issued on October 21, 1986 to Thomas G. Switall, Assignee: Ryco Graphic Manufacturing, Inc.
6	U.S. Patent No. 4,825,804 entitled: Vertically Retracting Coater, Issued on May 2, 1989 to Mark A. Dirico and Phillip Rodriguez, Assignee: Dahlgren International, Inc.
7	European Patent Application No. EP 0647 524 A1 entitled: High Velocity, Hot Air Dryer and Extractor, Applicant: Howard W. DeMoore; Inventors: Howard W. DeMoore and Howard Curtis Secor; Filed: August 5, 1994; Date of Publication: April 12, 1995
8	Papier Kunstsoff Verabeiter, vol 26 (no. 6), 1 June 1991 at p. 129 Xpooo232825 "Lakier-Aggregat Fuer Speedmaster-Maschinen"
9	Prosecution History of Canadian Patent No. 2,175,731 entitled: Retractable Inking/Coating Apparatus Having Ferris Movement Between Printing Units Inventors: Howard W. DeMoore, Ronald M. Rendleman and John W. Bird Owner: Howard W. DeMoore, Filed on May 3, 1996
10	Japanese Patent Application No. 63-62733
11	U.S. Patent No. 4,882,991 entitled: Change-Over Inking Unit of a Sheet-Fed Rotary Press, Issued on November 28, 1989 to Claus Simeth, Assignee: M.A.N. Roland Druckmaschinen Aktiengesellschaft
12	Japanese Application No. 96146371 entitled: Retractable Inking/Coating Apparatus Having Ferris Movement Between Printing Units

1

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(54) Retractable inking/coating apparatus having ferris movement between printing units

(57) A retractable in-line inking/coating apparatus (10) selectively applies either spot or overall ink/coating material to a blanket (B) or flexographic plate (P) on a blanket cylinder (34), or spot or overall ink/coating to a flexographic printing plate (P) on a plate cylinder (32) in a rotary offset printing press (12). The inking/coating apparatus is pivotally mounted on a printing unit (22, 24, 26, 28) or dedicated coating unit, and is extendable into and retractable out of an operative inking/coating position by a carriage assembly (58) which is pivotally coupled to the printing unit. Because of the pivotal support provided by a cantilevered support arm (88, 90), the inking/coating apparatus is extended and retracted through a Ferris wheel arc between adjacent printing units.

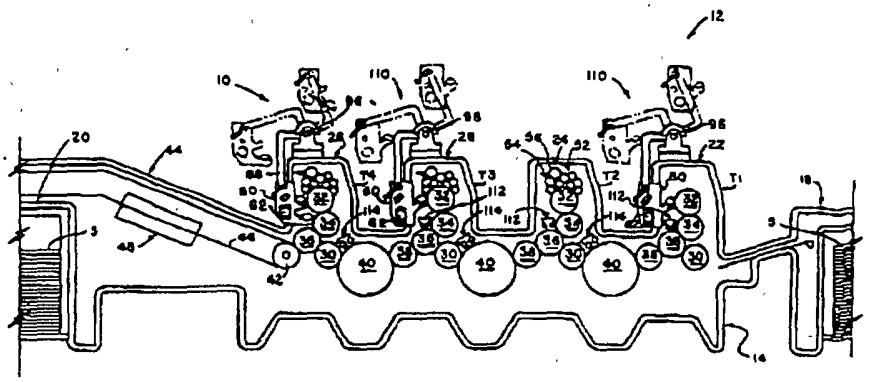

FIG. 1

EP 0 741 025 A3

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 96 30 3136

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X Y	US 4 841 903 A (BIRD) * abstract; claims; figure 1 *	1,15-17 4-6,8,9, 13	B41F31/30 B41F5/24 B41F23/08
X	US 5 107 790 A (SLIKER ET AL.) * abstract; claim 1; figures * * column 2, line 9 - line 22 *	1,18	
Y	US 5 335 596 A (DEMOORE ET AL.) * abstract; figures 1-4 * * column 7, line 32 - line 58 *	4,5,8,9	
Y	US 4 617 865 A (SWITALL) * abstract; figures 1-3 * * column 6, line 9 - line 42 *	6	
Y	US 4 825 804 A (DIRICO ET AL.) * abstract; figures 2,3 * * column 3, line 10 - line 21 *	13	
A	EP 0 647 524 A (DEMOORE) * abstract; figures 1,2,5 * * column 4, line 32 - line 40 *	15-22	TECHNICAL FIELDS SEARCHED (Int.Cl.6) B41F
A	PAPIER + KUNSTSTOFF VERARBEITER, vol. 26, no. 6, 1 June 1991, page 129 XP000232825 "LACKIER-AGGREGAT FUER SPEEDMASTER-MASCHINEN"	I	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	20 March 1997	Helpiö, T

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

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(11) EP 0 741 025 A2

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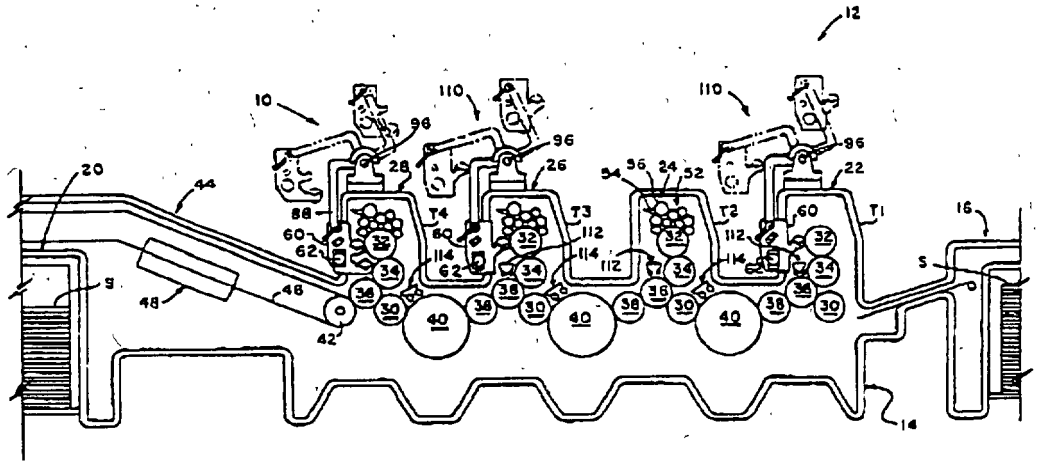

FIG. 1

EP 0 741 025 A2

Description

This invention relates to sheet-fed or web-fed, rotary offset or flexographic printing presses, and more particularly, to a new and improved inking/coating apparatus for the in-line application of printing inks or protective or decorative coatings to sheet or web substrates.

Conventional sheet-fed, rotary offset printing presses typically include one or more printing units through which individual sheets are fed and printed with wet ink. Since the inks used with rotary offset printing presses typically remain wet and tacky for some time after printing, special precautions must be taken to insure that the freshly printed sheets are not marked or smeared as the sheets are transferred from one printing unit to another, and while being conveyed to the sheet delivery stacker. The printed surface of the freshly printed sheet dries relatively slowly and can be smeared during subsequent transfer between printing units. In order to reduce smearing and offsetting, spray powder is applied on the printed sheet.

In some printing applications, offset and smearing are prevented by applying a protective and/or decorative coating over all or a portion of the freshly printed sheets. Various arrangements have been proposed for applying the protective or decorative coating as an in-line operation by using the last printing unit of the press as the coating application unit. However, when such in-line coating is performed, the last printing unit cannot be used to apply ink to the sheets, and can only be used for the coating operation. Thus, while coating with these types of in-line coating apparatus, the press loses the capability of printing its full range of colors since the last printing unit is converted to a coating unit.

It will be appreciated that the time required to reconfigure a press for coating or non-coating is non-productive and costly. Accordingly, there is a need for an in-line coating apparatus that minimizes the time to clean-up from one printing run and set-up and run the next job. Where consecutive jobs require the same type of coating, particularly blanket coating, it may not be necessary to clean-up the coater between jobs. However, the coating material cannot be allowed to dry on the rollers. Therefore, especially when switching from blanket to spot coating or vice versa, or if there is a delay between jobs, it is necessary to wash-up the coater after each job is completed.

In addition, coater wash-up is necessary when switching between different coating compositions, such as aqueous and ultra violet (UV) curable coatings. Such coating materials are not interchangeable, and consequently, the coater must be washed between applications of different coating media.

The foregoing limitations are overcome, according to the present invention, by a retractable, in-line inking/coating apparatus which is mounted on a printing unit for pivotal, Ferris wheel movement between an operative inking/coating position and a retracted, overhead idle position. The inking/coating apparatus includes an applicator head which, is positioned in alignment with either the plate cylinder or the blanket cylinder by a carriage assembly which includes a cantilevered support arm. The support arm is pivotally coupled between the inking/coating head and the printing unit tower. This cantilevered, pivotal mounting arrangement allows the inking/coating unit to be used between two printing units, as well as on the last printing unit of the press.

In the preferred embodiment, the applicator head includes vertically spaced pairs of cradle members with one cradle pair being adapted for supporting a metal or ceramic coating roller in alignment with a blanket cylinder, and the other cradle pair supporting a resilient anilox coating roller in alignment with the plate cylinder, respectively, when the carriage assembly is in the operative position. Because of the cantilevered, pivotal support provided by the support arm, the applicator head can be lifted and lowered through an arc, similar to Ferris wheel movement, in the limited space between adjacent printing units. When fully retracted, the applicator head and carriage assembly are lifted to an elevated, retracted overhead position, preferably an overhead position overlying the printing unit tower, thus providing complete access to the interstation space and the printing unit cylinders without causing the printing unit to lose its printing capability. The inking/coating applicator roller of the applicator head can be inspected, cleaned or replaced and the doctor blade assembly can be washed-up automatically while the inking/coating apparatus is in the retracted position.

When the inking/coating apparatus is used in combination with a flexographic printing plate and aqueous ink or aqueous coating, the water component of the aqueous ink or coating on the freshly printed sheet is evaporated by a high velocity, hot air interstation dryer and a high volume heat and moisture extractor assembly so that the freshly printed ink or coating is completely dry before the sheet is printed on the next printing unit. This quick drying flexographic printing/coating arrangement permits a base coat of ink, for example opaque white or metallic ink (gold, silver or other metallics) to be applied in the first printing unit, and then overprinted by a lithographic process on the next printing unit.

Exemplary embodiments of the present invention are illustrated in the drawing figures wherein:

FIGURE 1 is a schematic side elevational view of a sheet-fed, rotary offset printing press having inking/coating apparatus embodying the present invention;

FIGURE 2 is a perspective view of the printing press of FIGURE 1 in which a dual head inking/coating apparatus is in the operative coating position and a single head coater is in a retracted, overhead position;

FIGURE 3 is an enlarged simplified perspective view showing one side of the single head ink-

ing/coating apparatus of FIGURE 1 in the operative position;

FIGURE 4 is a simplified side elevational view showing the dual head inking/coating apparatus in the operative coating position for spot or overall coating from the blanket position;

FIGURE 5 is a simplified side elevational view showing the single head inking/coating apparatus in the operative coating position for spot or overall coating from the plate position; and,

FIGURE 6 is a simplified side elevational view of the dual head inking/coating apparatus of FIGURE 4, partially broken away, which illustrates the hydraulic drive assembly and doctor blade assembly.

As used herein, the term "processed" refers to various printing methods which may be applied to either side of a substrate, including the application of UV-curable and aqueous inks and/or coatings. The term "substrate" refers to sheet or web material. Also, as used herein, the term "waterless printing plate" refers to a printing plate having non-image surface areas which are hydrophobic and also having image surface areas which are hydrophilic, wherein the non-image surface areas are characterized by a surface tension value which is less than the surface tension of aqueous ink, and the image surface areas are characterized by a surface tension value which is greater than the surface tension of aqueous ink. "Flexographic" refers to flexible printing plates having a relief surface which is wettable by aqueous ink or aqueous coating material.

As shown in the exemplary drawings, the present invention is embodied in a new and improved in-line inking/coating apparatus 10, for applying inks or protective and/or decorative coatings to sheets or webs printed in a sheet-fed or web-fed, rotary offset or flexographic printing press, herein generally designated 12. In this instance, as shown in FIGURE 1, the inking/coating apparatus 10 is installed in a four color printing press 12, such as that manufactured by Heidelberger Druckmaschinen AG of the Federal Republic of Germany under its designation Heidelberg Speedmaster 102V. The press 12 includes a press frame 14 coupled at one end, herein the right end, to a sheet feeder 16 from which sheets, herein designated S, are individually and serially fed into the press, and at the opposite end, with a sheet delivery stacker 20 in which the freshly printed sheets are collected and stacked. Interposed between the sheet feeder 16 and the sheet delivery stacker 20 are four substantially identical rotary offset printing units 22, 24, 26 and 28 which can print different color inks onto the sheets as they are transferred through the press 12. The printing units are housed within printing towers T1, T2, T3 and T4 formed by side frame members 14, 15.

As illustrated, the printing units 22, 24, 26 and 28 are substantially identical and of conventional design. The first printing unit 22 includes an in-feed transfer cylinder 30, a plate cylinder 32, a blanker cylinder 34 and an impression cylinder 36, all supported for rotation in parallel alignment between the press side frames 14, 15. Each of the first three printing units 22, 24 and 26 have an interunit transfer cylinder 38 disposed to transfer the freshly printed sheets from the adjacent impression cylinder to the next printing unit via an interstation transfer cylinder 40. The last printing unit 28 is shown equipped with a delivery cylinder 42 which guides each freshly printed sheet 18 as it is transferred from the last impression cylinder 36 to a delivery conveyor system, generally designated 44, to the sheet delivery stacker 20.

The delivery conveyor system 44 as shown in FIGURE 2 is of conventional design and includes a pair of continuous delivery gripper chains 46, only one of which is shown carrying at regular spaced locations along the chains, laterally disposed gripper bars having gripper fingers for gripping the leading edge of a freshly printed sheet 18 after it leaves the nip between the delivery cylinder 42 and impression cylinder 36 of the last printing unit 28. As the leading edge is gripped by the grippers, the delivery chains 46 pull the freshly printed sheet away from the impression cylinder 36 and deliver the freshly printed sheet to the sheet delivery stacker 20.

Prior to reaching the delivery sheet stacker, the freshly printed and/or coated sheets S pass under a delivery dryer 48 which includes a combination of infrared thermal radiation, high velocity hot air flow and heat and moisture extraction for drying the ink and/or the protective/decorative coating on the freshly printed sheets.

In the exemplary embodiment shown in FIGURE 1, the first printing unit 22 is equipped with a flexographic printing plate, and does not require an inking roller train or a dampening system. If an ink roller train is mounted on the first printing unit, the form rollers are retracted and locked off when the printing unit goes on impression. Flexographic aqueous ink is supplied by the inking/coating unit 110. The remaining printing units 24, 26 and 28 are equipped for lithographic printing and include an inking apparatus 50 having an inking roller train 52 arranged to transfer ink from an ink fountain 54 to the plate cylinder 32. This is accomplished with the aid of a fountain roller 56 and a ductor roller. The fountain roller 56 projects into the ink fountain 54, whereupon its surface is wetted with printing ink Q. The printing ink Q is transferred intermittently to the inking roller train 52 by the ductor roller. The inking roller train 52 supplies printing ink Q to the image ares of a printing plate P mounted on the plate cylinder 32.

The printing ink Q is transferred from the printing plate P to an ink receptive blanket B which is mounted on the blanket cylinder 34. The inked image carried on the blanket B is transferred to a sheet S as the sheet is transferred through the nip between the impression cylinder 36 and the blanket B.

The inking roller arrangement 52 illustrated in FIGURE 1 is exemplary for use in combination with lithographic ink printing plates. It will be understood that

dampening rollers (not illustrated) will be in direct engagement with the lithographic plate P, but are not used in combination with the flexographic plate of printing unit 22.

Referring now to FIGURE 4, FIGURE 5 and FIGURE 6, the in-line inking/coating apparatus 10 includes a carriage assembly 58 which supports an applicator head 60. The applicator head 60 includes a hydraulic motor 62, a lower gear train 64, an upper gear train 65, an applicator roller 66 and a doctor blade assembly 68. The external peripheral surface of the applicator roller 66 is inserted into wetting contact with liquid coating material or ink contained in a reservoir 70. The reservoir 70 is continuously supplied with ink or coating which is circulated through the reservoir 70 from an off-press source by a pump (not illustrated). The hydraulic motor 62 drives the applicator roller 66 synchronously with the plate cylinder 32 and the blanket cylinder 34 in response to an RPM control signal from the press drive (not illustrated) and a feedback signal developed by a tachometer 72. While a hydraulic drive motor is preferred, an electric drive motor can be used.

The applicator roller 66 is preferably a fluid metering anilox roller which transfers measured amounts of printing ink or coating material onto the printing plate or blanket. The surface of an anilox roller is engraved with an array of closely spaced, shallow depressions referred as "cells". Ink or coating material from the reservoir 70 flows into the cells as the anilox roller turns through the reservoir. The transfer surface of the anilox roller is scraped with a doctor blade 73 to remove excess ink or coating. The ink or coating remaining on the anilox roller is the measured amounts contained within the cells.

The applicator roller 66 is cylindrical and may be constructed in various diameters and lengths, containing cells of various sizes and shapes. The volumetric capacity of an anilox roller is established during manufacturing and is dependent upon the selection of cell size, shape and number of cells per unit area. Depending upon the intended application, the cell pattern may be fine (many small cells per unit area) or coarse (fewer larger cells per unit area).

By applying the ink or coating material through the inking/coating applicator head 60, more ink or coating material can be delivered to the sheet S as compared with the inking roller train of a lithographic printing unit. Moreover, color intensity is stronger and more brilliant because the flexographic ink is applied at a much larger film thickness than can be applied by the lithographic process and is not diluted by dampening solution.

The inking/coating applicator head 60 includes side frame members 74, 76 that support the applicator roller 66, gear train 64, gear train 65, doctor blade assembly 68 and the drive motor 62. The applicator roller 66 is supported at opposite ends on a lower cradle formed by a pair of end plates 78, 80 which hold the applicator roller 66 in parallel alignment with the blanket cylinder 34 (FIGURE 5). The side frames 74, 76 are also provided with an upper cradle formed by a pair of side plates 82, 84 which are vertically spaced with respect to the lower side plates 78, 80. Each cradle has a pair of sockets 79, 81 and 83, 85, respectively, for holding the applicator roller 66 for spot coating or inking engagement against the plate P of the plate cylinder 32 (FIGURE 4) or the blanket B of the blanket cylinder 34.

Preferably, the applicator roller 66 for the upper cradle (plate) position is an anilox roller having a resilient transfer surface. In the dual cradle arrangement, the press operator can quickly change over from blanket inking/coating and plate inking/coating with minimum press down time, since it is only necessary to remove and reposition or replace the applicator roller 66, and wash-up the doctor blade assembly if changing from ink to coating or vice versa. The capability to selectively operate in either the flexographic mode or the lithographic mode and to print or coat from either the plate or blanket position is referred to herein as the "LITHOFLEX" process.

Referring again to FIGURE 2 and FIGURE 3, the applicator head 60 is supported by the carriage assembly 58 in a cantilevered, pivotal arrangement which allows the dual cradle inking/coating apparatus 10 and a single cradle inking/coating apparatus 110 to be used between any two adjacent printing units, as well as used on the first and last printing units of the press. This is made possible by a pair of cantilevered support arms 88, 90 that are pivotally coupled to the side plates 74, 76, respectively, on a pivot shaft 77. Each support arm has a hub portion 88A, 90A, respectively, and an elongated shank portion 88B, 90B, respectively.

The cantilevered support arms are pivotally mounted on the printing tower by pivot blocks 92, 94, respectively. The hub portions 88A, 90A are journalled for rotation on pivot shafts 96, 98, respectively. The pivot blocks 92, 94 are securely fastened to the tower 14D, so that the carriage assembly 86 is pivotally suspended from the pivot shafts 96, 98 in a cantilevered Ferris support arrangement. The shank portions 88B, 90B are pivotally coupled to the pivot shaft 77, so that the carriage assembly 58 and the applicator head 60 are capable of independent rotation with respect to each other and with respect to tee pivot shaft 77. By this arrangement, the applicator head 60 is pivotally suspended from the pivot shaft 77, and remains in an upright orientation as the support arms rotate from the operative position to the fully retracted position, and vice versa.

Thus, the cradles 78, 80 and 82, 84 position the applicator roller 66 in vertical and horizontal alignment with the plate cylinder or blanket cylinder when the applicator head is extended to the operative position, for example as shown in FIGURE 4 and FIGURE 5. Moreover, because of the transverse relationship between the hub portion and shank portion of the support arms, the applicator head 60 and carriage assembly 58 are capable of rotating through a Ferris arc without touching the adjacent printing tower. This makes it possible to install the inking/coating apparatus 10 on any intermedi-

ate printing unit tower (T2, T3), and as well as on the first printing unit tower T1 and the last printing unit tower T4. Additionally, when the inking/coating unit 10 is in the operative position, the lateral projection of the applicator head 60 into the interstation space between printing units is minimized. This assures virtually unrestricted operator access to the interstation space between adjacent printing units when the applicator head is engaged in the operative position, and completely unrestricted access when the carriage assembly 58 is retracted.

Rotation of the carriage assembly 58 is counterclockwise from the retracted, idle position (shown in phantom in FIGURE 1) to the operative position (FIGURE 4 and FIGURE 5). The carriage assembly 58 can be adapted for clockwise rotation from the retracted position to the operative position for engagement of the applicator roller to either the plate or the blanket on the dampener side of the tower, assuming that access to the plate and blanket is not restricted by dampener rollers or the like.

Rotational movement of the support arms 88, 90 is assisted by counterweights 100, 102 which are secured to the support arms, respectively, for concurrent rotation with respect to the pivot blocks 92, 94. With the passive assistance of the counterweights, the press operator can easily move the inking/coating assembly 10 from the engaged operative position as shown in FIGURE 4 to the fully retracted, idle position as shown in phantom in FIGURE 1. Preferably, rotation of the carriage assembly 58 is assisted by a torsion spring, electric motor or hydraulic motor.

The inking/coating apparatus 10 is releasably locked into the operative position as shown in FIGURE 4 by releasable latch couplings 103, 105 that secure the support arms 88, 90 to the press side frames 14, 15, respectively, of the printing unit tower T4 in the operative position. Coating engagement of the applicator roller 66 against the blanket cylinder 34 is produced by power actuators, preferably pneumatic cylinders 104, 106 which have extendable/retractable power transfer arms 104A, 106A, respectively. The pneumatic cylinder 104 is pivotally coupled to the support arm 88 by a pivot linkage 108, and the second pneumatic cylinder 106 is pivotally coupled to the support arm 90 by a pivot linkage 109. In response to actuation of the pneumatic cylinders 104, 106, the power transfer arms are retracted. As the transfer arms retract, the inking/coating head 60 is rotated counterclockwise on the pivot shaft 77, thus moving the applicator roller 66 into coating engagement with the blanket cylinder 34.

The pivot linkage 108 includes a bell crank 111 which is mounted for pivotal movement on a pin 113. The pin 113 is supported by a clevis plate 115 which is attached to the support arm 88. One end of the bell crank is pivotally coupled to the actuator arm 104A, and a cam roller 117 is mounted for rotation on its opposite end.

The cam roller 117 is engagable against an adjustable stop 119 which is rigidly secured to the side plate 74. Counterclockwise shifting of the handle H moves a cam follower 121 into a latch pocket 123 of a receiver block 125 as the cam roller 117 is moved into engagement with the adjustable stop 119 in the interlocked, operative position. Referring to FIGURE 4, FIGURE 5 and FIGURE 6, the receiver block 125 is secured to the delivery side of the printing unit tower by machine screws.

When the plate P goes on impression, power is applied to the pneumatic actuator 104 and the power transfer arm 104A retracts, thus causing the bell crank 111 to rotate counterclockwise about the pin 113. The torque applied by the pneumatic actuator 104 is transmitted to the applicator head 60 through the cam roller 117 and the adjustable stop 119. Counterclockwise movement of the applicator head 60 relative to the support shaft 77 carries the applicator roller 66 into engagement with the plate P.

The adjustable stop 119 has a threaded bolt 119A which is engagable with the cam roller 117. The striking point of engagement is preset so that the applicator roller 66 is properly positioned for engagement with the plate P or blanket B in the operative position when the applicator head 60 is interlocked with the press frame 14 and the printing unit goes on impression.

Referring to FIGURE 5, an inking/coating apparatus 110 having a single head is illustrated. The construction of this alternative embodiment is identical in all respects with the dual head arrangement, with the exception that only a single gear train and a single cradle for holding the applicator roller is provided. In both embodiments, the inking/coating head 60 remains upright as it swings through an arc, comparable to the movement of a Ferris wheel. Because of the upright orientation of the inking/coating head 60 as it moves between the extended and retracted positions, the usual platform spacing between printing unit towers provides adequate clearance to permit extension and retraction of the carriage assembly 58 without interference with operator access to the printing units. This is a significant advantage in that it permits the in-line inking/coating apparatus 10 to operate effectively in the interstation space between any adjacent printing units, and without blocking or obstructing access to the cylinders of the printing units when the inking/coating apparatus is in the retracted position (as indicated in phantom in FIGURE 1).

Moreover, when the in-line inking/coating apparatus is in the fully retracted position, the applicator roller 66 is conveniently positioned on the dampener side of the printing unit for inspection, clean-up or replacement. Additionally, the doctor blade assembly is also conveniently positioned for inspection, removal, adjustment or clean-up. Also, the doctor blade reservoir and coating circulation lines can be cleaned while the press is running as well as when the press has been stopped for change-over from one type of ink or coating material to another.

When the inking/coating apparatus is used for applying an aqueous ink or an aqueous coating material, the water component on the freshly printed sheet S is evaporated by a high velocity, hot air interstation dryer and high volume heat and moisture extractor units 112 and 114, as shown in FIGURE 1, FIGURE 4 and FIGURE 5. The dryer/extractor units 112 and 114 are oriented to direct high velocity heated air onto the freshly printed/coated sheets as they are transferred by the interunit and the intermediate transfer cylinders 36, 40. By this arrangement, the freshly printed aqueous ink or coating material is completely dry before the sheet is overprinted in the next printing unit.

The high velocity, hot air dryer and high performance heat and moisture extractor units 112, 114 utilize high velocity air jets which scrub and break-up the moist air level which clings to the surface of each freshly printed sheet. Within each dryer, high velocity air is heated to a high temperature as it flows across a resistance heating element within an air delivery baffle tube. High velocity jets of hot air are discharged through multiple airflow apertures through an exposure zone Z (FIGURE 4 and FIGURE 5) onto the freshly printed/coated sheet S as it is transferred by the transfer cylinder 36 and intermediate transfer cylinder 40, respectively. Each dryer assembly includes a pair of air delivery dryer heads which are arranged in spaced, side-by-side relation as shown in FIGURE 4 and FIGURE 5.

The high velocity, hot moisture-laden air displaced from each freshly printed sheet is extracted from the dryer exposure zone Z and completely exhausted from the printing unit by the high volume extractors. Each extractor head includes a manifold coupled to the dryer heads and draws the moisture, volatiles and high velocity hot air through a longitudinal gap between the dryer heads. According to this arrangement, each printed sheet is dried before it is run through the next printing unit.

The water-based inks used in flexographic printing dry at a relatively moderate drying temperature provided by the interstation high velocity hot air dryers/extractors 112, 114. Consequently, print quality is substantially improved since the aqueous ink is dried at each printing unit before it enters the next printing unit. Moreover, back-trapping on the blanket of the next printing unit is completely eliminated. This interstation drying arrangement makes it possible to print aqueous inks such as metallic ink and opaque white ink at one printing unit, and then overprint at the next printing unit.

This arrangement also permits the first printing unit to be used as a coater in which an aqueous coating is applied to low grade paper, for example recycled paper, to trap and seal in lint, dust, spray powder and other debris and provide a smoother, durable surface that can be overprinted in the next printing unit. The first down coating seals the surface of the low grade, rough substrate and improves overprinted dot definition while preventing strike-through and show-through. A UV-curable protective and/or decorative coating can be applied over the first down overprinted (aqueous) coating in the last printing unit.

Preferably, the applicator roller 66 is constructed of metal or ceramic when it is used for applying a coating material to the blanket B on the cylinder 34. When the applicator roller 66 is applied to the plate, it is preferably constructed as an anilox roller having a resilient transfer surface for engaging a flexographic printing plate. Suitable resilient roller surface materials include Buna N synthetic rubber and EPDM (terpolymer elastomer).

It will be appreciated that the inking/coating apparatus 10 is capable of applying a wide range of ink types, including fluorescent (Day Glo), pearlescent, metallics (gold, silver and other metallics), glitter, scratch and sniff (micro-encapsulated fragrance), scratch and reveal, luminous, pressure-sensitive adhesives and the like.

The press operator can eliminate the dampener roller assembly altogether, and the inking/coating apparatus 10 can selectively apply aqueous inks and coatings to a flexographic or waterless printing plate and the blanket. Moreover, overprinting of the aqueous inks and coatings can be carried out in the next printing unit since the aqueous inks and coatings are completely dried by the high velocity, hot air interstation dryer and high volume heat and moisture extractor assembly.

The aqueous inks and coatings as used in the present invention contain colored pigments and/or soluble dyes, binders that fix the pigments onto the surface of the printed sheet, and waxes, defoamers and thickeners. Aqueous printing inks predominantly contain water as a solvent, diluent and/or vehicle. The thickeners which are preferred include algonates, starch, cellulose and its derivatives, for example cellulose esters or cellulose ethers and the like. Coloring agents including organic as well as inorganic pigments may be derived from dyes which are insoluble in water. Also, the printing ink may contain water and can be predominantly glycol or the like, with the pigment being bound by an appropriate resin. When metallic inks are printed, the cells of the anilox roller must be appropriately sized to prevent the metal particles from getting stuck within the cells. The cell size is critical, and for metallic gold ink, the anilox roller should have a screen line count in the range of 175-300 lines per inch (69-118 lines per cm).

The inking/coating apparatus 10 can also apply UV-curable inks and coatings. If UV-curable inks and coatings are utilized, ultra-violet dryers/extractors are installed adjacent the high velocity hot air dryer/extractor units 112, 114, respectively.

It will be appreciated that the inking/coating apparatus 10 described herein makes it possible to selectively operate a printing unit in either the flexographic printing mode or the lithographic printing mode, while also providing the capability to print or coat from either the plate or blanket position. The dual cradle support arrangement of the present invention makes it possible to quickly change over from inking/coating at the blanket

cylinder position to inking/coating at the plate cylinder position with minimum press down-time, since it is only necessary to remove and reposition or replace the applicator roller 66 while the printing/inking apparatus is in the retracted position.

Moreover, the press operator may elect to spot or overall coat with aqueous ink/coating from the plate during one job, and then spot and/or overall coat from the blanket during the next job. Since the doctor blade assembly can be flushed and washed-up quickly and the applicator roller can be replaced quickly, it is possible to spot coat or overall coat from the plate position or the blanket position with aqueous inks or coatings during the first press run and then spot coat or overall coat with UV-curable inks or coatings from the plate position or from the blanket position during the next press run. The inking/coating apparatus 10 is completely out of the way in the retracted position; consequently, the doctor blade reservoir and supply lines can be flushed and washed-up by automatic wash-up equipment while the printing unit is printing another job.

The positioning of the applicator head and roller assembly relative to the plate and blanket is repeatable to a predetermined, preset impression position. Consequently, no printing unit adjustment or alteration is required, except for flushing the doctor blade assembly and cleaning or replacing the applicator roller to accommodate a different kind of ink or coating material. Although manual extension and retraction have been described in connection with the exemplary embodiment, extension to the operative position and retraction to a non-operative idle position can be carried out automatically by hydraulic or electric motor servomechanisms.

The Ferris wheel support arrangement allows the inking/coating apparatus to operate effectively in the interstation space between any adjacent printing units, as well as on the first or last printing units of the press, without blocking or obstructing the interstation space or restricting operator access to the cylinders of any of the printing units.

Finally, because the inking/coating apparatus of the present invention is mounted on a printing unit tower and is extendable to the operative position without requiring adjustment or alteration of the printing unit cylinders, it can be used for applying printing ink or coating material to the blanket cylinder of a rotary offset web press, or to the blanket of a dedicated coating unit.

Claims

1. Inking/coating apparatus (10) for use in a printing press (12) of the type having a printing unit (22, 24, 26, 28) on which a plate cylinder (32), a blanket cylinder (34) and an impression cylinder (36) are mounted for rotation, wherein the inking/coating apparatus is characterized by:

   an applicator head (60) for applying ink or coating material to a plate (P) mounted on the plate cylinder or to a blanket (B) mounted on the blanket cylinder, either separately or simultaneously when the inking/coating apparatus is in an operative position relative to the plate and blanket cylinders; and,

   a carriage assembly (58) for moving the applicator head to the operative position in which the applicator head is disposed laterally adjacent to the plate and blanket cylinders and for moving the applicator head from the operative position to a retracted position in which the applicator head is elevated with respect to the plate and blanket cylinders.

2. Inking/coating apparatus (10) as set forth in claim 1, wherein the carriage assembly (58) is characterized by:

   a support arm (88, 90) having a first end portion (88A) constructed for pivotal attachment to the printing unit and having a second end portion (88B) pivotally coupled to the applicator head (60), the applicator head being movable on the support arm to the operative position.

3. Inking/coating apparatus (10) as set forth in claim 1, characterized in that a counterweight (100, 102) is coupled to the carriage assembly.

4. Inking/coating apparatus (10) as set forth in claim 1, wherein the applicator head (60) is characterized by:

   a doctor blade assembly (68) having a reservoir (70) for receiving ink or liquid coating material; and,

   an applicator roller (66) coupled to the doctor blade assembly in fluid communication with the reservoir, the applicator roller being engagable with a printing plate (P) on the plate cylinder or with a blanket (B) on the blanket cylinder when the applicator head (60) is in the operative position.

5. Inking/coating apparatus (10) as set forth in claim 4, characterized in that the applicator roller (66) is an anilox roller having a resilient transfer surface.

6. Inking/coating apparatus (10) as set forth in claim 1, characterized in that:

   a power actuator (104, 106) is movably coupled to the applicator head (60), the power actuator having a power transfer arm (104A, 106A) which is extendable and retractable; and,

   movement converting apparatus (108) is coupled to the power transfer arm for converting

extension or retraction movement of the power transfer arm into pivotal movement of the applicator head (60) relative to the carriage assembly.

7. Inking/coating apparatus (10) as set forth in claim 6, wherein the movement converting apparatus (108) is characterized by:

a bell crank plate (111) having a first end portion coupled to the power transfer arm and having a second end portion for engaging a stop member;
a stop member (119) secured to the applicator head (60); and,
a clevis plate (115) secured to the carriage assembly (58) and pivotally coupled to the bell crank plate.

8. Inking/coating apparatus (10) as set forth in claim 1, wherein the applicator head (60) is characterized by:

first and second side frame members (74, 76) pivotally coupled to the carriage assembly (58);
a doctor blade assembly mounted on the first and second side frame members, the doctor blade assembly including a reservoir (70) for receiving ink or liquid coating material;
a cradle assembly (78, 80), (82, 84) mounted on the first and second side frame members, respectively;
an applicator roller (66) mounted for rotation on the cradle assembly and coupled to the doctor blade assembly for rolling contact with ink or coating material in the reservoir, the applicator roller being engagable with a printing plate (P) on the plate cylinder (32) or with a blanket (B) on the blanket cylinder (34) when the applicator head (60) is in the operative position; and,
a drive motor (62) coupled to the applicator roller for rotating the applicator roller.

9. Inking/coating apparatus (10) as set forth in claim 8, characterized in that:

the cradle assembly (79, 80) has first and second sockets (79, 81) disposed on the first and second side frame members respectively; and,
the applicator roller (66) is mounted for rotation on the first and second sockets.

10. Inking/coating apparatus (10) as set forth in claim 8, characterized in that

the cradle assembly (78, 80), (82, 84) includes first and second sockets (79, 81) disposed on the first and second side frame members, respectively, and third and fourth sockets disposed on the first and second side frame members, respectively; and,
the applicator roller (66) is selectively mountable for rotation on either the first and second sockets or on the third and fourth sockets for applying ink or coating material to either the plate or blanket when the applicator head is in the operative position.

11. Inking/coating apparatus (10) as set forth in claim 1, wherein the applicator head (60) is characterized by:

a first cradle (78, 80) for supporting an applicator roller (66) for engagement with the plate when the inking/coating apparatus is in the operative position; and
a second cradle (82, 84) for supporting an applicator roller (66) for engagement with the blanket (B) when the inking/coating apparatus is in the operative position.

12. Inking/coating apparatus (10) as set forth in claim 1, wherein the carriage assembly is characterized by:

a support arm (88, 90) having a first end portion pivotally coupled to the printing unit (88A, 90A) and having a second end portion (88B, 90B);
a common pivot shaft (77) on which the support arm second end portion and the inking/coating apparatus are pivotally mounted; and,
male and female latch members (103, 105) coupled between the common pivot shaft and the printing unit, with one of the latch members being secured to the common pivot shaft and the other latch member being constructed for attachment onto the printing unit, the latch members being mateable in interlocking engagement when the applicator head (60) is in the operative position.

13. Inking/coating apparatus (10) as set forth in claim 1, wherein the applicator head (60) and the printing unit are characterized by:

male and female latch coupling members (103, 105) mounted on the carriage assembly (58) and on the printing unit for releasably latching the carriage assembly in interlocking engagement with the printing unit when the applicator head is in the operative position

14. Inking/coating apparatus (10) as set forth in claim 1, wherein the carriage assembly (58) is characterized by an elongated shank portion (88B, 90B) and a hub portion (88A, 90A), the elongated shank portion being pivotally coupled to the applicator head

(60) and the hub portion being constructed for pivotal attachment onto the printing unit.

15. A rotary offset printing press (12) having first and second printing units (22, 24) and the inking/coating apparatus (10) of claim 1 is movably coupled to the first printing unit (22) as set forth in claim 1, characterized by:

a dryer (112) mounted on the first printing unit adjacent the impression cylinder (36) of the first printing unit for discharging heated air onto a freshly printed substrate while the freshly printed substrate is in contact with said impression cylinder.

16. A rotary offset printing press (12) as defined in claim 15, characterized in that:

an extractor (112E) is disposed adjacent the dryer for extracting hot air, moisture and volatiles from an exposure zone (Z) between the dryer and the freshly printed substrate.

17. A rotary offset printing press (12) as defined in claim 15, characterized in that:

an intermediate transfer cylinder (40) is coupled in sheet transfer relation with the impression cylinder (36) of the first printing unit (22); and,
an interstation dryer (114) is disposed adjacent the intermediate transfer cylinder for discharging heated air onto a freshly printed or coated substrate after it has been transferred from the impression cylinder of the first printing unit and while it is in contact with the intermediate transfer cylinder (40).

18. A method for rotary offset printing in a printing press (12) of the type including first and second rotary offset printing units (22, 24), and using aqueous or UV-curable printing ink or coating material in the operation of at least the first printing unit, characterized by the following steps performed at each printing unit in succession:

spot or overall coating a plate (P) with aqueous ink/aqueous coating material or UV-curable ink/UV-curable coating material;
spot and/or overall coating a blanket (B) with aqueous ink/aqueous coating material or UV-curable ink or UV-curable coating material;
transferring the printing ink or coating material from the printing plate (P) to the blanket (B);
transferring the inked or coated image from the blanket to a substrate (S) as the substrate is transferred through the nip between the impression cylinder (36) and the blanket (B); and,
drying the ink or coating material on the freshly printed substrate before the substrate is subsequently processed.

19. A method for rotary offset printing as defined in claim 18, wherein the drying step is characterized by:

discharging high velocity, heated air onto the freshly printed/coated substrate (S) while the freshly printed/coated substrate is in contact with the impression cylinder (36) of the first printing unit (22).

20. A method for rotary offset printing as defined in claim 18, characterized by the steps:

transferring the freshly printed substrate (S) from the first printing unit (22) to an intermediate transfer cylinder (40); and,
drying the freshly printed substrate while it is in contact with the intermediate transfer cylinder.

21. A method for rotary offset printing as defined in claim 18, characterized by the step:

extracting hot air, moisture and volatiles from an exposure zone (Z) above the freshly printed/coated substrate (S) while the freshly printed/coated substrate is in contact with the impression cylinder (36).

22. A method for rotary offset printing as defined in claim 18, characterized by the steps:

applying a primer coating of an aqueous coating material or UV-curable coating material to a substrate (S) in the first printing unit (22); and,
drying the primer coating on the substrate before the substrate is processed in the second printing unit.

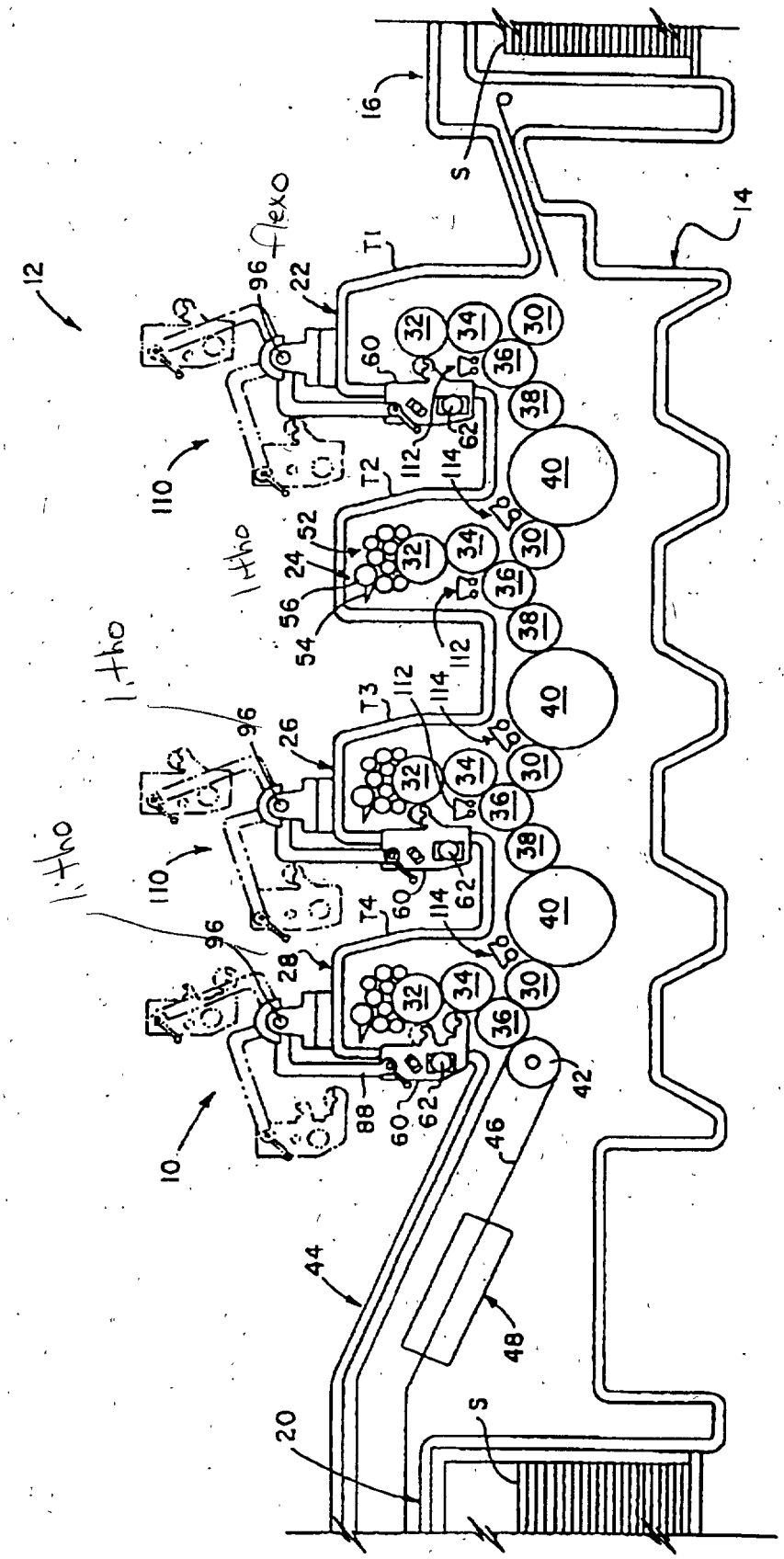
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FIG. 1

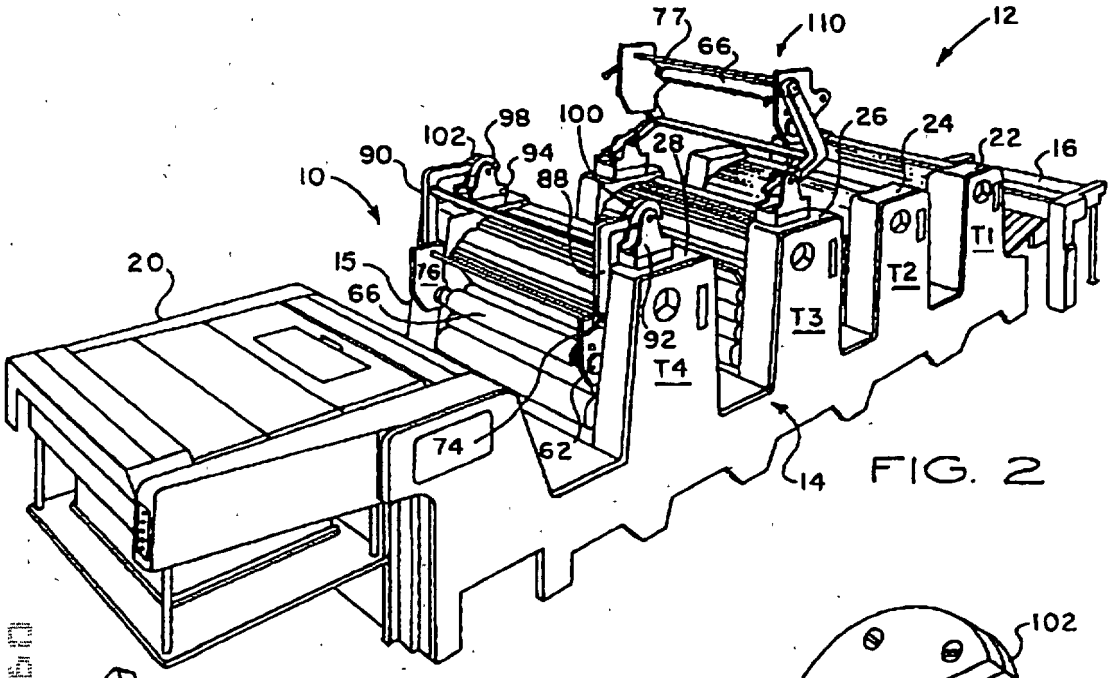
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FIG. 2

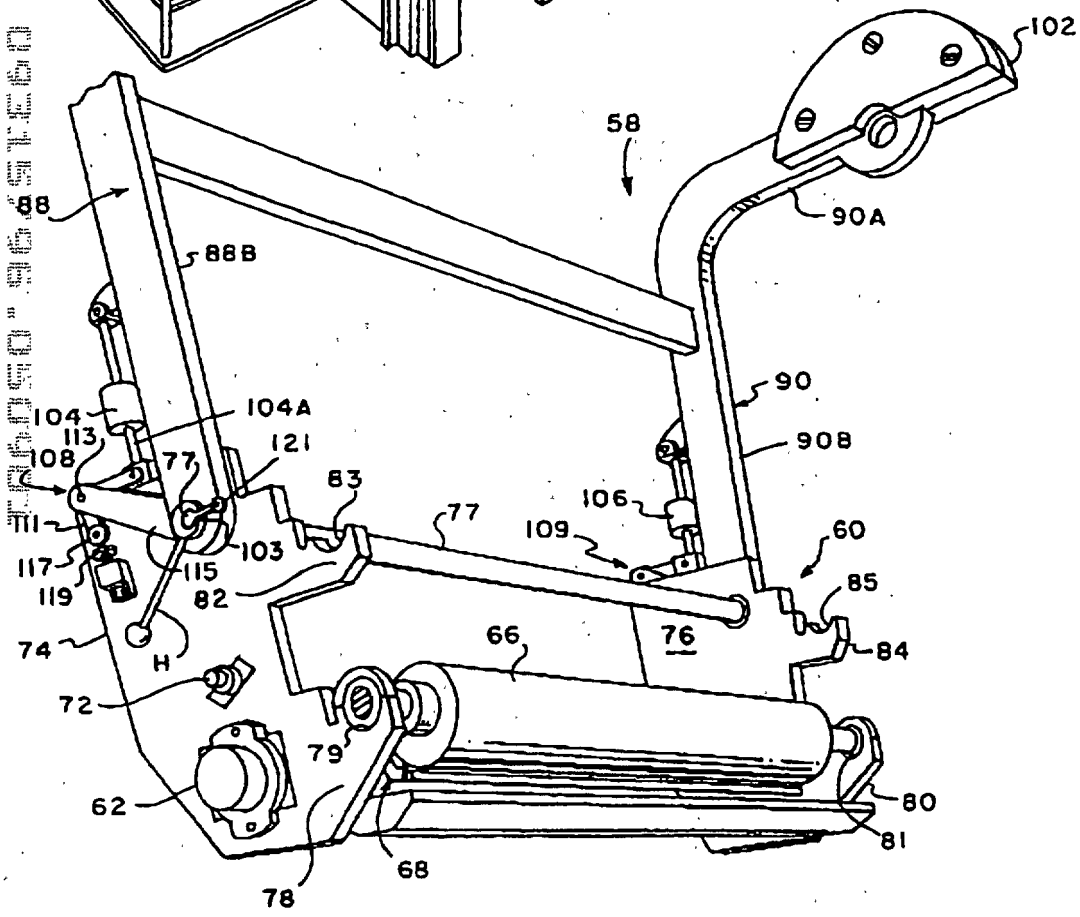
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FIG. 3

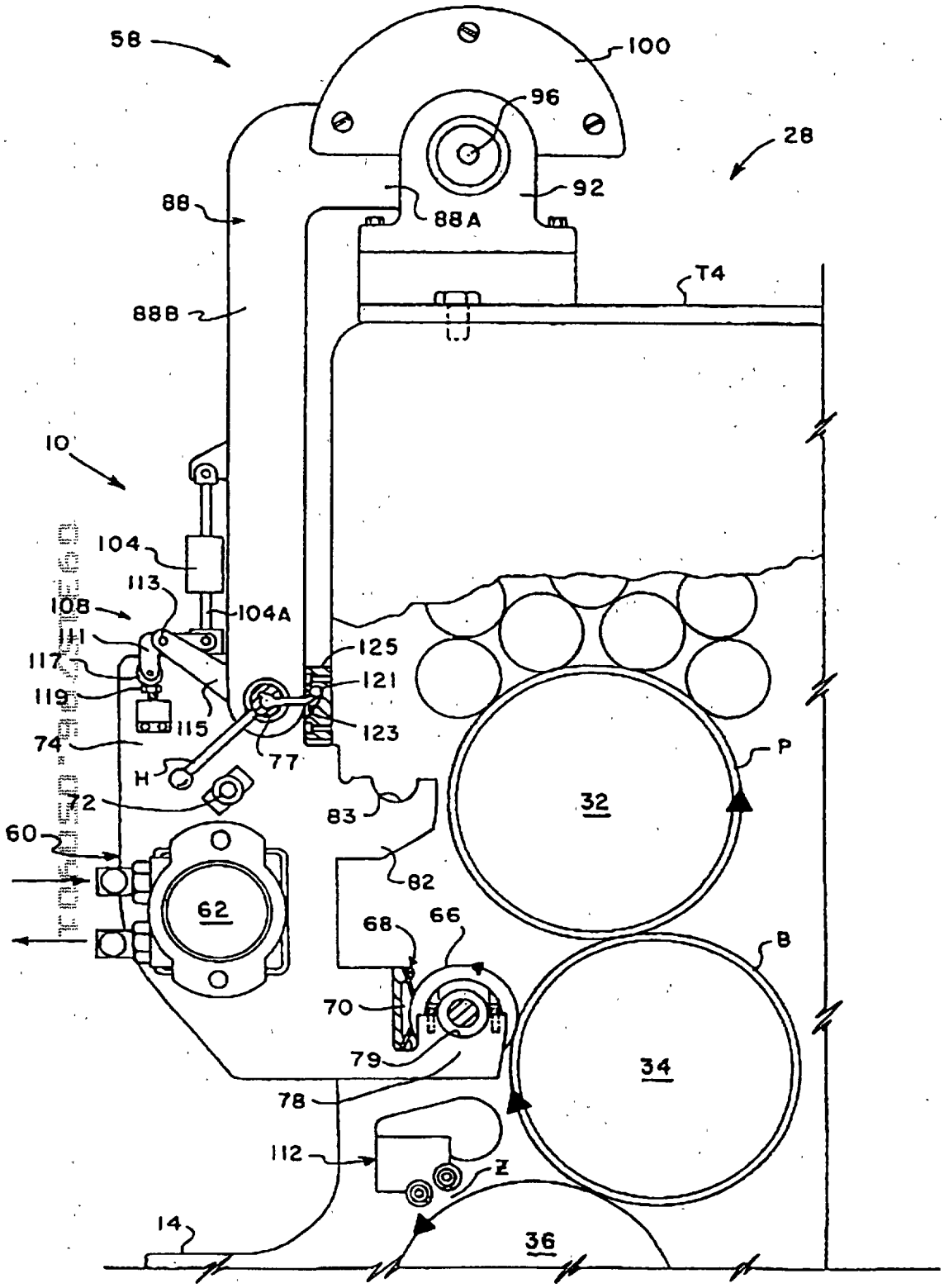
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FIG. 4

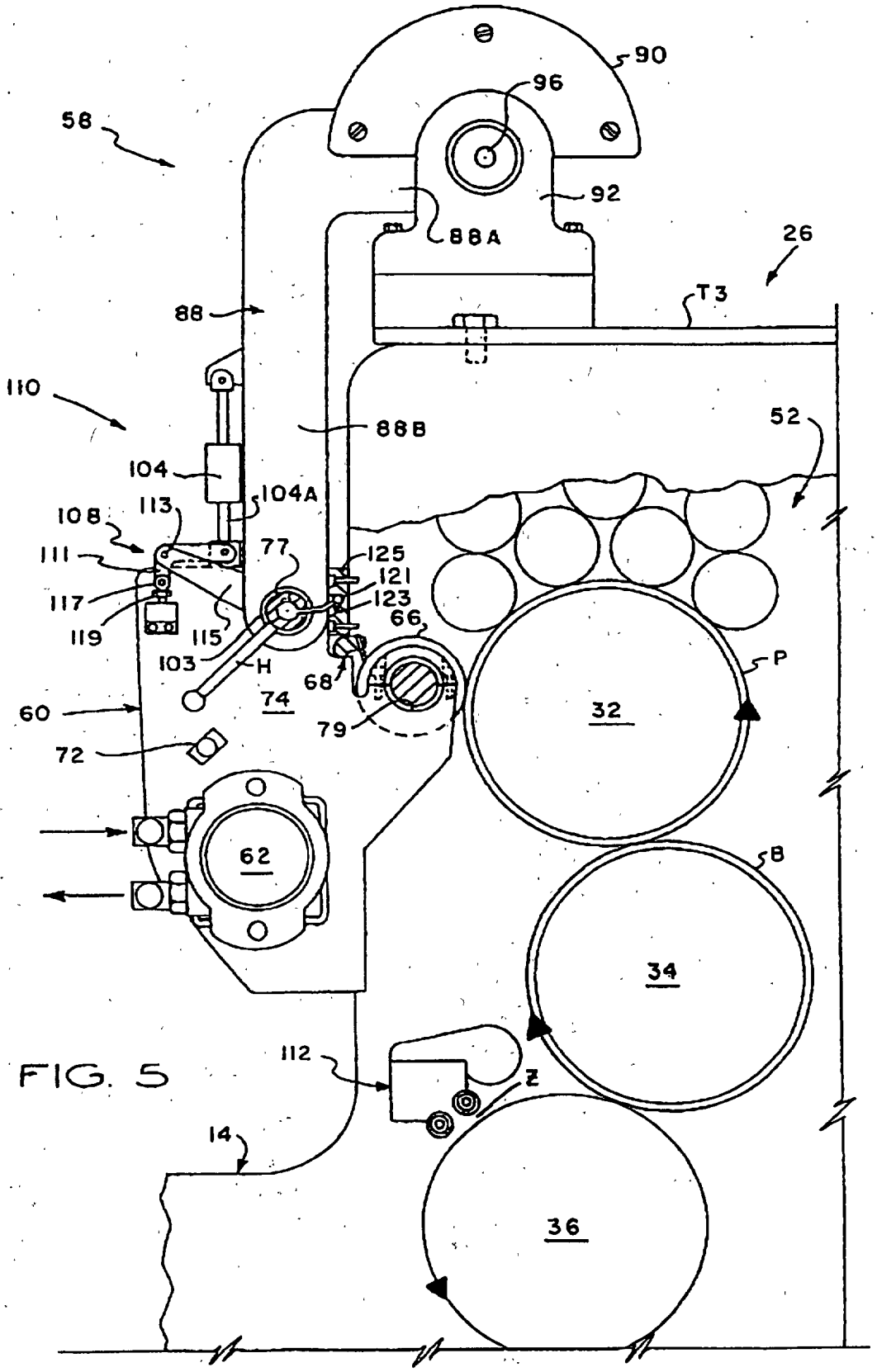
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FIG. 5

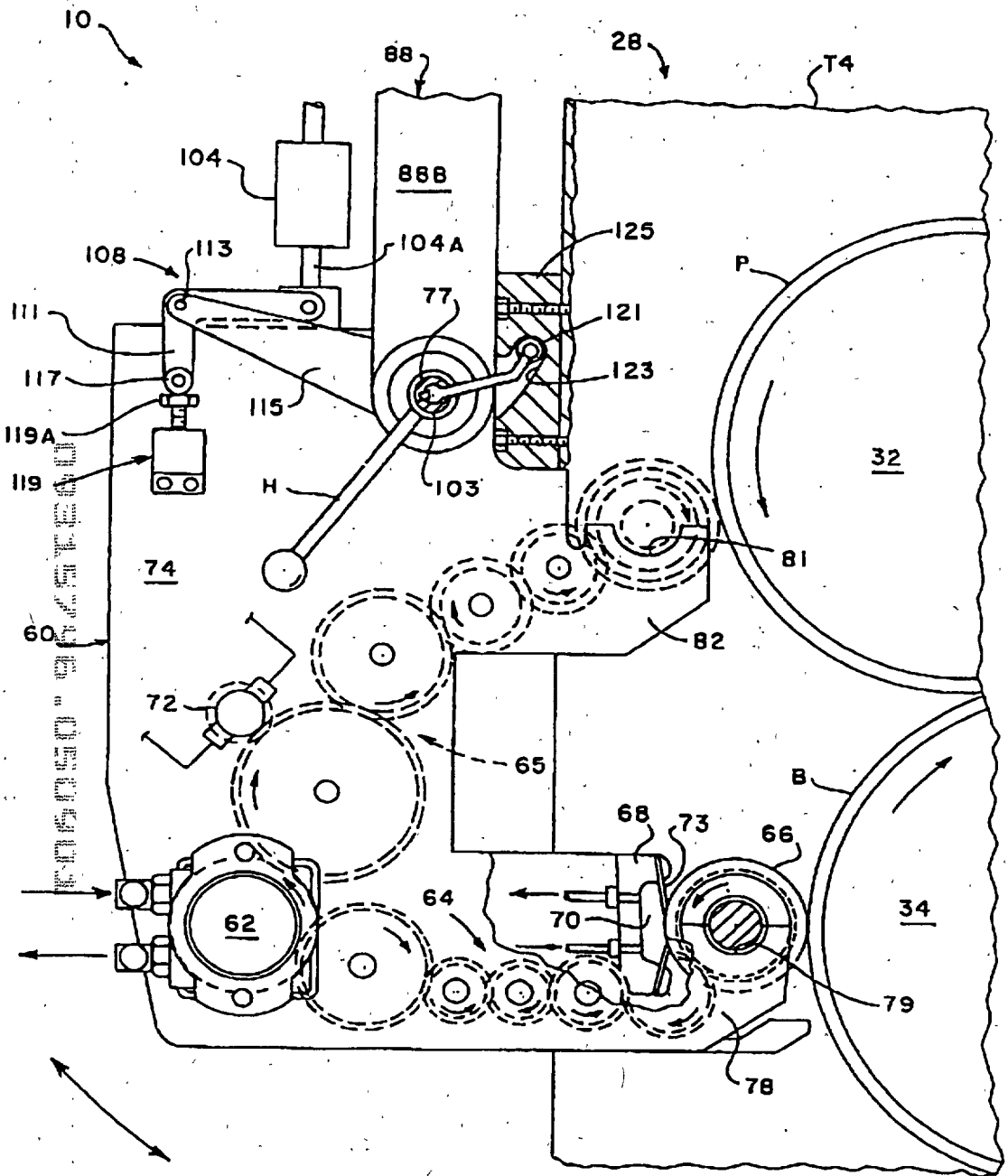
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FIG. 6

2

United States Patent [19]

Bird

[11] **Patent Number: 4,841,903**

[45] **Date of Patent: Jun. 27, 1989**

[54] **COATING AND PRINTING APPARATUS INCLUDING AN INTERSTATION DRYER**

[75] Inventor: **John W. Bird, Westport, Conn.**

[73] Assignee: **Birow, Inc., Westport, Conn.**

[21] Appl. No.: **65,914**

[22] Filed: **Jun. 24, 1987**

[51] **Int. Cl.**[4] **B05C 11/00**

[52] **U.S. Cl.** **118/46**; 101/201; 101/217; 118/66; 118/258; 118/262; 118/264; 118/602; 427/258; 427/382; 427/411

[58] **Field of Search** 118/46, 66, 602, 258, 118/264, 262; 101/201, 217; 427/382, 258, 411

[56] **References Cited**

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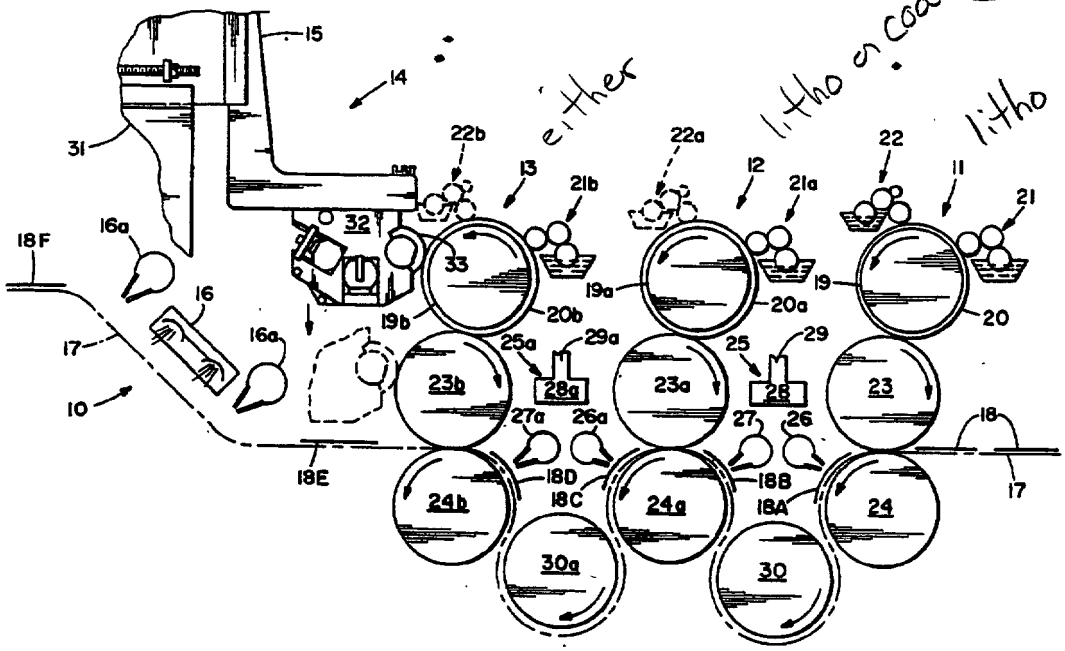
Primary Examiner—Bernard Pianalto

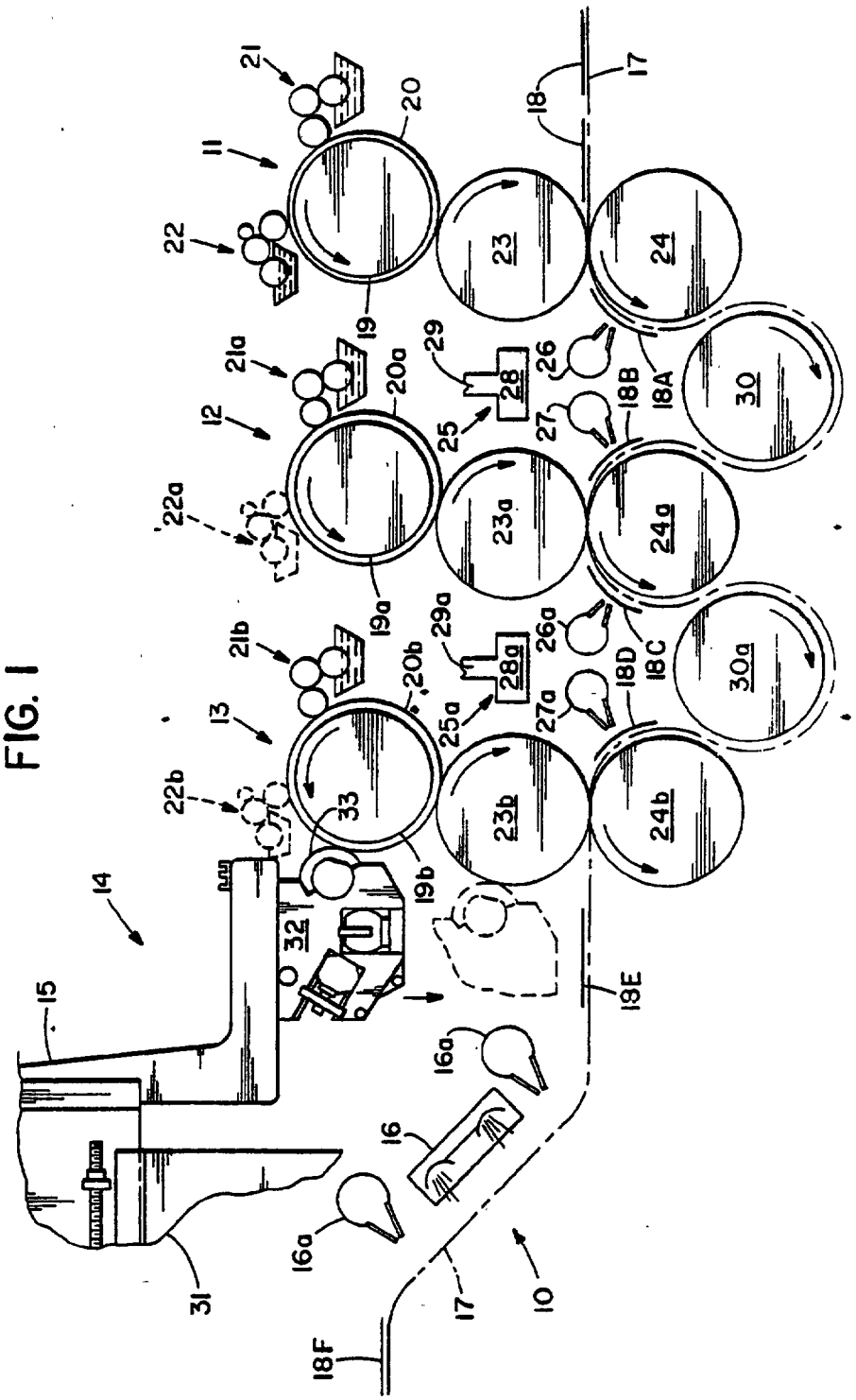
Attorney, Agent, or Firm—Perman & Green

[57] **ABSTRACT**

An offset lithographic printing method and machine having a plurality of in-line liquid application stations, at least one of which is an ink image-printing station for printing lithographic ink images on a suitable receptive copy sheet, and at least the final downstream liquid-application station is a coating application station for printing a protective, and/or aesthetic coating over selected portions of, or over the entire ink image-printed surface of the copy sheet. The present method and apparatus involves the placement of a drying station between liquid application stations to evaporate volatile solvent or vehicle from the ink images and/or to solidify the liquid coating applied at upstream stations before the application of a continuous or spot coating thereover at the next downstream coating station.

5 Claims, 1 Drawing Sheet

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26a
13
22b
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27a
18C
18D
30a
23b
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19b
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16a
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18F

FIG. 1

COATING AND PRINTING APPARATUS INCLUDING AN INTERSTATION DRYER

BACKGROUND OF THE INVENTION

Conventional lithographic offset printing machines or presses comprise one or more image-printing stations each having a plate cylinder to which is fastened a thin hydrophilic, oleophobic printing plate having image areas which are oleophilic and hydroprobic and background areas which are oleophobic and hydrophilic. The plate surface is continuously wetted with aqueous damping solution, which adheres only to the background areas, and is then inked with oleoresinous ink composition which adheres only to the image areas of the plate as wet ink. The ink is offset-transferred to the rubber surface of a contacting blanket cylinder, and then retransferred to the receptive surface of a copy web or a succession of copy sheets, such as of paper, where the ink gradually hardens or cures by oxidation after passing through a final drying station located downstream of the final liquid application station where the volatile solvent is evaporated from the ink composition of the images.

Since image-curing is gradual, it is conventional to spray the printed copies with starch or other "stilting" powder before the copies are stacked. This prevents sticking of the uncured ink images to adjacent copies and also permits the circulation of air for the oxidation-curing process.

In cases where cost is not a factor and/or where the aesthetic advantages of a protective supercoating are desired, it is known to provide the printing machine with a downstream coating station having a blanket cylinder associated with a coating application unit for the application of an overall protective coating over the entire printed area of the copy sheets or web.

This also avoids the necessity of powdering the printed images. Reference is made to U.S. Pat. No. 4,270,483 for its disclosure of such an apparatus. The coating unit of U.S. Pat. No. 4,270,483 is pivotally-associated with the blanket cylinder for movement between coating and non-coating or retracted positions. Reference is also made to my copending U.S. patent application, Serial No. 65,954, filed on even date herewith.

Protective coating compositions also improve the appearance of printed documents, particularly high quality, multi-color copies such as posters, product brochures, etc., by providing glossy or matte finishes over the entire image-printed surface or over selected image-printed portions thereof such as photographs, product illustrations, etc. Selected area coating, spot coating or perfect registration over predetermined limited printed areas of the copies is advantageous from a cost standpoint since the coating compositions are relatively expensive and the volume required is reduced if the coating is only printed in registration where desired. Also, spot coating is frequently used as a means for highlighting certain portions of the printed copies such as company name or logo, product illustrations, photographs, etc.

While the in-line application of a protective or aesthetic coating over the offset-printed images on a succession of copy sheets will prevent the dried but uncured printed images from sticking to adjacent copy sheets, the relatively wet condition of the printing ink composition and its solvent and/or diluent content, at the time that the coating composition is applied thereover, and the presence of water from the dampening system in the copy sheets, produces a visible change in the appearance of the portions of the coating overlying the printed images during the evaporation of the solvent, diluent, water, etc., whereby, for example, a glossy-surfaced protective coating acquires a flat, matte or non-glossy surface, particularly in areas overlying the dried and cured printed images, and even the affected areas are not uniform in appearance depending upon the colors and/or surface areas of the underlying printed images. For example, printed colored photographs, half-tone illustrations, and the like, which are intended to be emphasized or heightened in appearance, such as by the application of glossy spot coatings thereover, undergo loss or degradation in the uniformity of their appearance and their color during the drying of the copy sheets.

Also, in cases where the protective or aesthetic coating is only spot-applied, such as over printed photographs, product illustrations, etc., the images printed on other surface areas of the copy sheets remain exposed and can stick to adjacent copy sheets unless stilting powder is applied, as discussed herein before.

The speed of operation of conventional offset printing and coating machines makes it impossible to apply successive continuous and spot coatings to a succession of copy sheets because the second coating will not adhere properly to the first coating while the latter is still wet, and/or the second coating will undergo degradation or loss of gloss during drying of the underlying coating.

These defects are of substantial importance in cases where the additional expense of one or more coatings is justified by the desired results, i.e., promotional posters, artwork, product containers, record jackets, videocassette boxes, etc. The defects, i.e., uneven surface appearance of the coating(s), detract from the appearance of the underlying images or photographs, particularly in the case of multi-colored images or photographs and are due to the presence of residual volatile solvents, diluents, water, etc., within the oleoresinous inks of the images or photographs, and the presence of water in the copy sheets, at the time that the first coating is applied thereover, and/or to the presence of volatile solvents, diluents or water within the first coating or undercoating at the time that the second coating is applied thereover. The application of a top coating over the printed images and/or over a first coating retards the volatile solvent, diluent or water against escape in the final drying station, but it eventually migrates into the top coating during the final drying and gradual curing of the ink images over a period of several hours time, resulting in a loss of perfection in the surface finish of the top coating.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a novel printing and coating method and apparatus for the in-line application of one or more protective or aesthetic coatings over imaged subject matter offset-printed onto each of a succession of copy sheets while avoiding the usual degradation or loss of uniformity of the surface appearance of areas of the coating(s) applied over the printed images and/or over underlying coated areas.

It is another objective of the present invention to enable the in-line application of a second protective or aesthetic coating, such as a glossy-finish spot coating, over a first protective coating, such as a continuous matte-finish coating, while avoiding the problems of poor adhesion and degradation or loss of glossy surface appearance of the second coating.

Essentially, the present invention is concerned with providing unblemished coated lithographic copies of the types desired in cases where the additional expense of supercoatings is justified by the desired results.

The present method and apparatus provides for the in-line drying of lithographic ink images, including photographic multi-color reproductions, and/or the drying of first continuous or spot coatings, printed or applied at one liquid application station before the application of a continuous or spot coating over said ink images or over said continuous spot coating at the next downstream liquid application station by interposing an in-line drying station between said one and next liquid application stations in order to more completely dry the ink images or first coating prior to the application of a final coating thereover, whereby the eventual drying of said final coating results in a substantially perfect surface finish

The oleoresinous inks conventionally used to print lithographic copies generally comprise a mixture of oxidizable drying oils, such as safflower oil or linseed oil, a compatible resin binder material, such as a phenolic resin or a varnish, pigment such as carbon black, drying agents, and a volatile solvent such as mineral spirits, or other solvent for the resin and oil. The printed copy sheets also contain some water from the dampening system. Drying of the images occurs in two stages, namely evaporation of the volatile solvent in the first stage to form the relatively dry, tacky printed images, and oxidation-curing of the oleoresinous printed composition which requires several hours time and results in the final non-sticky, smear-resistant printed images. The present invention is concerned with first-stage drying or solvent/water evaporation prior to the application of a supercoating over the printed images

The coating compositions conventionally-used to apply protective or aesthetic coatings over printed lithographic images are aqueous solutions, dispersions or emulsions of water-dispersible or water-soluble film-forming binder materials, such as acrylic resins, hydrophilic colloids, vinyl alcohol, etc. Also, coating compositions free of volatile solvents or vehicles are commonly used, such as resin precursor compositions which are polymerizable or curable by exposure to ultraviolet or other radiation. Such compositions are based upon liquid acrylic monomers or pre-polymers, or photopolymers and photoinitiators, cross-linking agents and/or other conventional ingredients. Both solvent-applied and solvent-free coating compositions can produce microporous coatings which are permeable to oxygen to hasten the curing of the oleoresinous inks. While they are also permeable to the volatile ink solvents, diluents and water, the escape of these volatiles mars the appearance of the surface finish of the coatings, as discussed supra.

The second problem, pertinent to the embodiment of drying between coating stations, relates to the reduced receptivity of wet undercoatings for supercoatings applied thereover, producing uneven, discontinuous or spotty supercoatings having "holidays" or areas which have not accepted the supercoating.

The novel method and apparatus of the present invention overcomes these problems by drying the ink-imaged and/or undercoated copy sheets prior to the application of the undercoating over the ink-printed images and/or prior to the application of the supercoating over the undercoating, whereby substantially-perfect coatings having excellent surface properties, such as gloss, are produced.

DESCRIPTION OF THE DRAWING

FIG. 1 is a vertical cross-sectional view, through the final three liquid application stations of an offset printing machine, illustrating the interposition of in-line drying stations between the last two liquid application stations and a final downstream liquid application station which is a coating-application station.

DETAILED DESCRIPTION OF THE DRAWING

Referring to the drawing, FIG. 1 illustrates a downstream portion of an offset printing machine 10 comprising three liquid application stations 11, 12 and 13, a coating apparatus 14 according to aforementioned copending application Serial No. 65,954 filed June 24, 1987, comprising a coating carriage 15, a final radiation drying station 16 including air knives 16a, and a continuous copy sheet conveyor means 17 which moves a succession of copy sheets 18 through the printing machine.

The first liquid application station 11 is a conventional offset image printing station comprising a plate cylinder 19, to which is clamped an imaged lithographic printing plate 20 carrying oleophilic image areas, such as words, photographs, etc. on an oleophobic, hydrophilic background. The conventional clamping means permits some degree of lateral or axial adjustment and some degree of wrap-around or circumferential adjustment of the plate 20 relative to the plate cylinder 19. Plate cylinder 19 is associated with a dampening system 21 for wetting the entire hydrophilic background surface of plate 20 with aqueous dampening fluid, and with an inking system 22 for selectively inking the image areas of the plate 20 with liquid oleoresinous ink composition containing a volatile organic solvent

The inked plate 20 is rotated against the ink-receptive surface of a blanket cylinder 23, to which the wet ink images are offset or transferred, and the blanket cylinder 23 is rotated against a copy sheet 18, passed in the nip between the blanket cylinder 23 and an impression cylinder 24, to transfer the wet ink images to the copy sheet 18 and form an image-printed copy sheet 18A. Some water from the dampening system is also transferred to the surface of the copy sheet 18A. Sheet 18A is conveyed, imaged face up, through a 25 first drying interstation 25, comprising a pair of spaced, elongate air knives 26 and 27 and a vapor-extraction unit 28 containing an intake fan and a outlet conduit 29 which conveys the volatile vehicle vapors to a recovery unit, to the atmosphere or for 30 other safe disposal.

As illustrated, the printed copy sheets 18A, are conveyed by grippers past the first air knife 26, under transfer cylinder 30 and past the second air knife 27, to form dried printed copy sheets 18B which move into the next liquid application station 12.

The air knives 26 and 27 and the extraction unit 28 are conventional elements normally used as final drying elements on printing and coating machines of different types. Knives 26 and 27 are elongate tubular elements provided with an elongate narrow slot formed by op-

posed, converging walls. Heated air is circulated through the tubular elements under pressure and is expelled from the elongate slot as a concentrated narrow band of high speed hot air which is directed against the ink-printed copy sheets 18A to evaporate the volatile solvent and water therefrom to release solvent and water vapor which is withdrawn by the extraction unit 28. Substantial drying is produced by the first air knife 26, and the second air knife 27 preferrably is included, as illustrated, to insure complete drying prior to the entry of the copy sheets 18B to the next liquid application station.

In the apparatus of FIG. 1, the second liquid application station 12 can be either another ink printing station, such as for printing ink of a second color, or it can be a first coating station Thus the various elements of station 12 are numbered similarly to those of station 11 but including the suffix a.

Where station 12 is another ink printing station, the first drying interstation 25, upstream therefrom, functions only as a supplemental drying station and can be excluded or disconnected.

Where station 12 is a first coating application station, the first drying interstation 25 is a critical component of the present invention. In such case, the inking system 22*a* of station 12 is withdrawn, as shown by means of broken lines, and the dampening system 21*a* is converted to a dampener coater system by providing a continuous supply of the desired coating composition to the supply pan thereof, i.e., an aqueous dispersion of a film-forming binder material containing in the case of matte-finish coatings, a diffusion filler such as silica or the like.

Generally, where the station 12 is a first coating station, the top roll 19*a* will be a plate cylinder having a full plate 20*a* for the application of continuous coatings to the intermediate blanket cylinder 23*a* or transfer cylinder and then to the dried ink-printed copy sheets 18B to form continuous coated printed copy sheets 18C. However, if desired, plate cylinder 19*a* may have a spot-receptive plate or relief plate 20*a* for the transfer of spot coatings to the intermediate blanket cylinder 23*a* and then to predetermined areas of the printed copy sheets 18B to form spot-coated printed copy sheets 18C.

Most commonly, the first coating will be a complete or continuous coating of a composition providing a matte non-glossy finish or a utility (semi-gloss) finish, and the second coating will be a spot coating of a composition providing a glossy finish to highlight predetermined areas of the printed, coated copies.

The coated printed copy sheets 18C exiting the first coating station 12 are conveyed by grippers, coated side up, through the second drying interstation 25awhich is similar to the first drying station 25 and comprises a similar pair of spaced elongate air knives 26*a* and 27*a* and a similar extraction unit 28*a* and exhaust outlet conduit 29*a*.

The line of forced hot air from the first knife 26*a*, across the width of the copy sheets, substantially dries the first coating by evaporating the water vehicle therefrom, after which the dried, coated copy sheets 19D are conveyed by transfer roll 30*a* to the second air knife 27*a* to insure complete drying of the first coating prior to the entry of the coated printed copy sheets 18D into the final coating station 13 which includes the coating-application apparatus of the copending application, in the illustrated embodiment, but which may be a conventional coating station.

In cases where the first and/or second coating composition is free of volatiles and solidifies by polymerization curing, the drying interstation 25*a* and/or downstream drying station 16 will contain a suitable radiation source such as ultraviolet lamps.

The coating application station 13 also can be similar to the inking station 11 and first coating station 12 with respect to the plate cylinder 19*b* supporting a printing plate, dampening system 21*b*, inking system 22*b*, blanket cylinder 23*b* and impression cylinder 24*b* since, in a conventional offset printing machine having a plurality of liquid application stations, all of the stations are generally similar but use different printing plates to image different areas of the same copy sheet with different colored inks. The present apparatus, requiring at least one coating-application station, and modifies at least the final downstream inking station to convert it permanently or intermittently to a coating-application station as shown by FIG. 1 or, alternatively, as illustrated by U.S. Pat. No. 4,270,483 discussed hereinbefore.

Plate 20*b* is an offset relief printing plate, preselected areas of which are raised above the background, generally referred to as "relief spots" Such spots are sized and positioned to correspond to areas of the image-printed copy sheets 18D which it is desired to selectively coat.

The adjustable coating apparatus 14 is mounted onto the frame 31 of the printing machine for extension of the coating carriage 15 into the liquid application station 13 for adjustable coating association with either the coating plate cylinder 19*b* or the coating blanket cylinder 23*b*, as desired.

The preferred coating application apparatus 14 includes a coating carriage 15 which is horizontally adjustably, in the machine direction, for movement between retracted or passive position and extended or active position, and also vertically adjustable for movement between the levels of the plate cylinder and the blanket cylinder as shown by means of broken lines. Moreover, the coating carriage 15 comprises a horizontally-adjustable coating applicator unit 32 which is movable in the machine direction between different extended coating positions to move the coating applicator roll 33 into coating association with printing and blanket cylinders which are not in vertical alignment, as disclosed in detail in my aforementioned copending application.

Thus, the coating carriage 15 and the applicator unit 32 are adjusted in the final coating station 13 to associate applicator roll 33 with either the spot relief plate 20*b* on printing roll 19*b*, for the printing of spot coatings, or with the blanket roll 23*b*, for the application of continuous coatings onto the dried, coated, printed copy sheets 18D, to form double-coated printed copies 18E. Copies 18E are transported by grippers past a final downstream radiant dryer 16 and air knives 16*a*, to evaporate the water vehicle from the second coating and form final copies 18F which are stacked to permit final curing of the oleoresinous printing ink.

The essential novelty of the present invention resides in the interposition of a drying station, such as 25 and 25*a*, between an ink printing station and a coating station, and preferably also between coating stations on machines having a plurality of coating stations, in order to substantially completely evaporate the volatile solvent or vehicle from the printed ink images, and evaporate any residual dampening water from the printed copy sheets, before the application of a spot or continuous coating thereover, and preferably to substantially

completely solidify and dry the first coating such as by irradiating to polymerize or by evaporating the volatile solvent, vehicle and/or water from the coated, printed copy sheets before the in-line application of a second spot or continuous coating over the first-applied coating, as illustrated.

In operation, a succession of copy sheets **18** is automatically gripped by the conveyor means **17** and transported through one or more ink printing stations **11** into printing contact with one or more ink blanket rolls **23** to print images, such as of different colors, on predetermined areas of each copy sheet, using conventional oleoresinous inks containing volatile organic solvent(s). At each ink-printing station **11**, an offset printing plate **20** is fastened to a plate cylinder **19**, moistened with water/chemical dampening fluid by means of dampening unit **21** and inked by means of inking unit **22**. The ink is selectively received by the image areas of the plate **20**, where some water dampening solution is picked up by the ink, transferred to the surface of the blanket cylinder **23** and re-transferred to the upper surface of a copy sheet **18** passed in the nip of cylinder **23** and impression cylinder **24**. At this point, the ink images on each imaged copy sheet **18A** still contain the volatile organic solvent and some water dampening solution which migrates into the copy paper.

Rather than moving the inked copy sheets **18A** directly from a printing station **11** to a coating station **12**, as is conventional in the art, the present method and apparatus provides for intermediate or interstation drying of the inked copies to evaporate the volatile organic solvent and water dampening solution from the ink images and copy paper to form solvent-free copies **18B** prior to the application of a protective and/or aesthetic coating thereover.

In the embodiment of FIG. **1** the ink-printed copies **18A** are moved through an interstation drying station **25** by directing the path of the copy sheets down under a transfer cylinder **30** and up over the coating impression cylinder **24***a* of the coating station **12**. The drying of the copy sheets is accomplished by one or more high velocity hot air knife drying elements, such as **26** and **27** shown in FIG. **1**, which heat the ink image, sufficiently lowering the solvent vapor pressure while the high velocity air scrubs the vapor from the surface to evaporate substantially all of the volatile organic solvent and water and form substantially solvent-free copies **18B** before the copies **18B** pass in the coating nip at coating station **12**.

The evaporated solvent and moisture is drawn into the solvent extraction unit **28** by an exhaust fan **31** and removed from the ambient atmosphere by conduit **29** for safety purposes.

On machines having a single coating application station, such as station **12** or station **13** of FIG. **1**, the solvent-free copies **18B** are moved through said coating station **12** or **13** to receive either a continuous or a spot coating to form coated, printed copy sheets **18C** which are transported to the final downstream drying station **16**, **16***a*. On machines having two coating stations **12** and **13** used for the application to two superposed coatings, either of which may be spot or continuous, matte or glossy, the dried, printed copy sheets **18B** are moved through the first coating station **12** to form coated, printed copy sheets **18C** which are moved through the second interstation drying station **25***a* to form dried coated copy sheets **18D**. Sheets **18D** are moved through the second coating station **13** and on through the downstream drying station **16**, **16***a*.

After curing for several hours, the coated, printed copies **18F** are found to be free of the surface defects of copy sheets printed and coated in similar manner but in the absence of interstation drying.

While the present specification and drawing refer to a continuous copy sheet conveyor means **17** carrying automatic grippers, it will be clear to those skilled in the art that most printing and coating machines convey the copy sheets by means of automatic grippers present on each of a series of contacting cylinders, such as the impression cylinders **24**, **24***a* and **24***b* and the interposed transfer cylinders **30** and **30***a* of FIG. **1**.

It is to be understood that the above described embodiments of the invention are illustrative only and that modifications throughout may occur to those skilled in the art. Accordingly, this invention is not to be regarded as limited to the embodiments disclosed herein, but is to be limited as defined by the appended claims.

What is claimed is:

1. In a continuous in-line offset lithographic printing machine for printing and coating a continuous succession of receptive copy paper sheets, comprising a plurality of liquid application stations, each comprising a plate cylinder for supporting a lithographic printing plate and including means for supplying oleous printing composition to oleophilic image areas on the water-coated surface of a said printing plate supported thereon, a blanket cylinder for receiving said printing composition and water from said plate cylinder and for transferring said printing composition and water to a succession of individual receptive copy paper sheets, and an impression cylinder forming a nip with said blanket cylinder through which said individual receptive copy paper sheets are passed to receive printing composition and water from said blanket cylinder, at least one said liquid application station being an upstream ink printing station for the transfer of printing composition in the form of ink images containing a volatile vehicle onto said succession of copy sheets, and at least one said liquid application station being a downstream coating station for the application of a printing composition in the form of a continuous or spot coating of liquid composition over the ink-imaged surface of said copy sheets, means for feeding said succession of individual receptive copy paper sheets through the nips of said blanket and impression cylinders of said liquid application stations, and a final downstream drying station for drying or otherwise solidifying said coated copy paper sheets, the improvements which comprises an intermediate in-line drying station positioned after each of said liquid application stations, each said drying station comprising means for directing forced hot air against the ink printed copy paper sheets to effect the evaporation of water and the volatile vehicle from the ink images printed on said copy paper sheets prior to the entry of the ink-imaged copy paper sheets into the next liquid application station including into said coating station.

2. A printing machine according to claim **1** having two adjacent downstream coating stations, characterized by the presence of another intermediate in-line drying station positioned in-line therebetween to effect the solidification of the coating applied at the first coating station prior to the entry of the coated copy sheets into the second coating station.

3. A printing machine according to claim 1 in which said coating station comprises a coating application assembly which is adjustably supported for coating association with either the plate cylinder, for the application of spot coatings, or the blanket cylinder, for the application of continuous coatings, to said copy sheets.

4. A printing machine according to claim 1 in which said intermediate drying station also comprises a vapor extraction means.

5. A printing machine according to claim 1 in which said means comprises an air knife.

* * * * *

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US005107790A

United States Patent [19]

Sliker et al.

[11] Patent Number: 5,107,790

[45] Date of Patent: Apr. 28, 1992

[54] **TWO HEADED COATER**

[75] Inventors: **Larry J. Sliker, Livonia; Robert S. Conklin, Rochester, both of N.Y.**

[73] Assignee: **Rapidac Machine Corp., Rochester, N.Y.**

[21] Appl. No.: **463,115**

[22] Filed: **Jan. 11, 1990**

[51] **Int. Cl.**[5] **B05C 1/08; B05C 11/00**

[52] **U.S. Cl.** **118/674; 118/46; 118/212; 118/249; 118/255; 118/258; 118/262**

[58] **Field of Search** ..... **118/674, 46, 249, 255, 118/258, 262, DIG. 1; 101/247, 329, 352**

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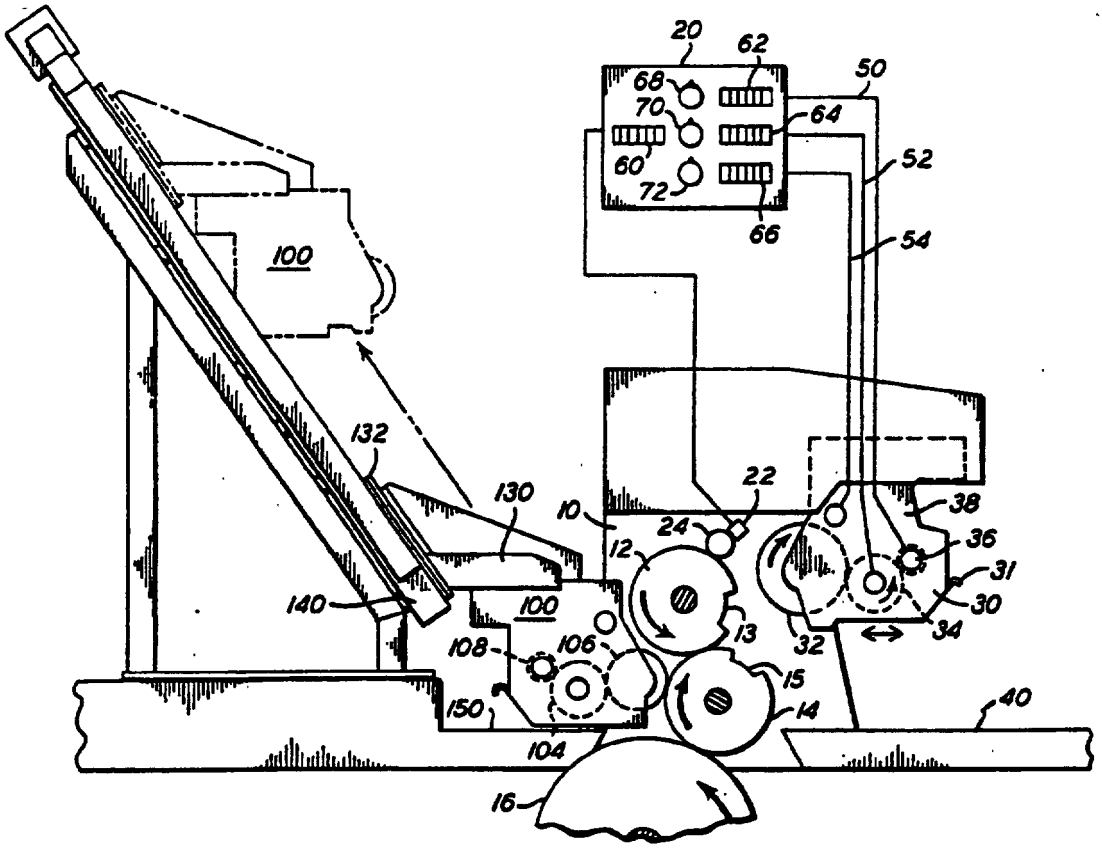
Primary Examiner—Michael G. Wityshyn
Attorney, Agent, or Firm—Cumpston & Shaw

[57] **ABSTRACT**

Coating apparatus for applying continuous or spot coatings to an image printed surface includes a plate cylinder; a blanket cylinder for transferring a coating material from the plate cylinder to the copies; a blanket coating roller for transferring a continuous layer of coating material to the blanket cylinder; a plate coating roller for selectively applying spot coating material to the plate cylinder; a first retractor for moving the blanket coating roller laterally into and out of transferring engagement with the blanket cylinder; and a second retractor for moving the plate coating roller into and out of transferring engagement with the plate cylinder.

14 Claims, 3 Drawing Sheets



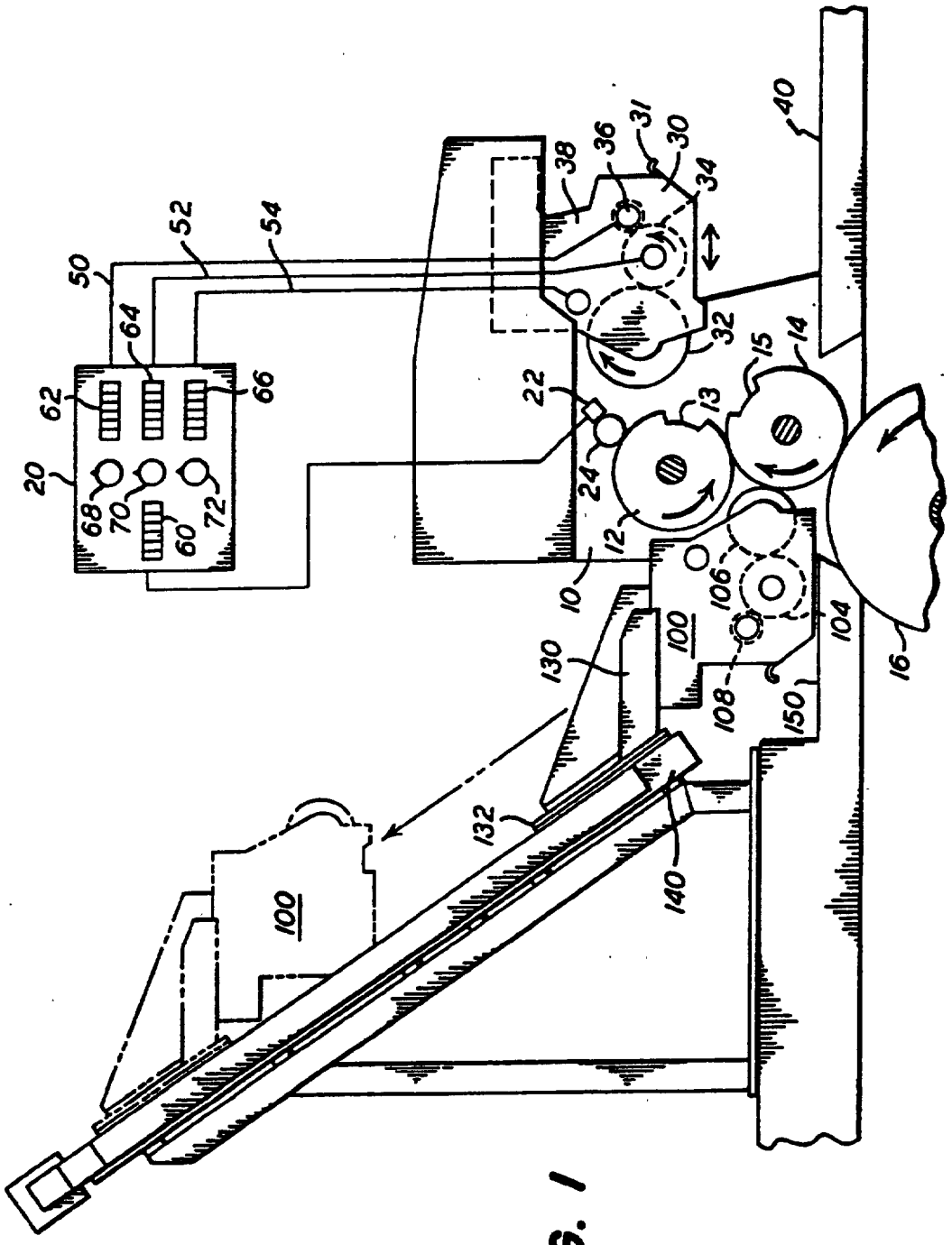

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FIG. 1

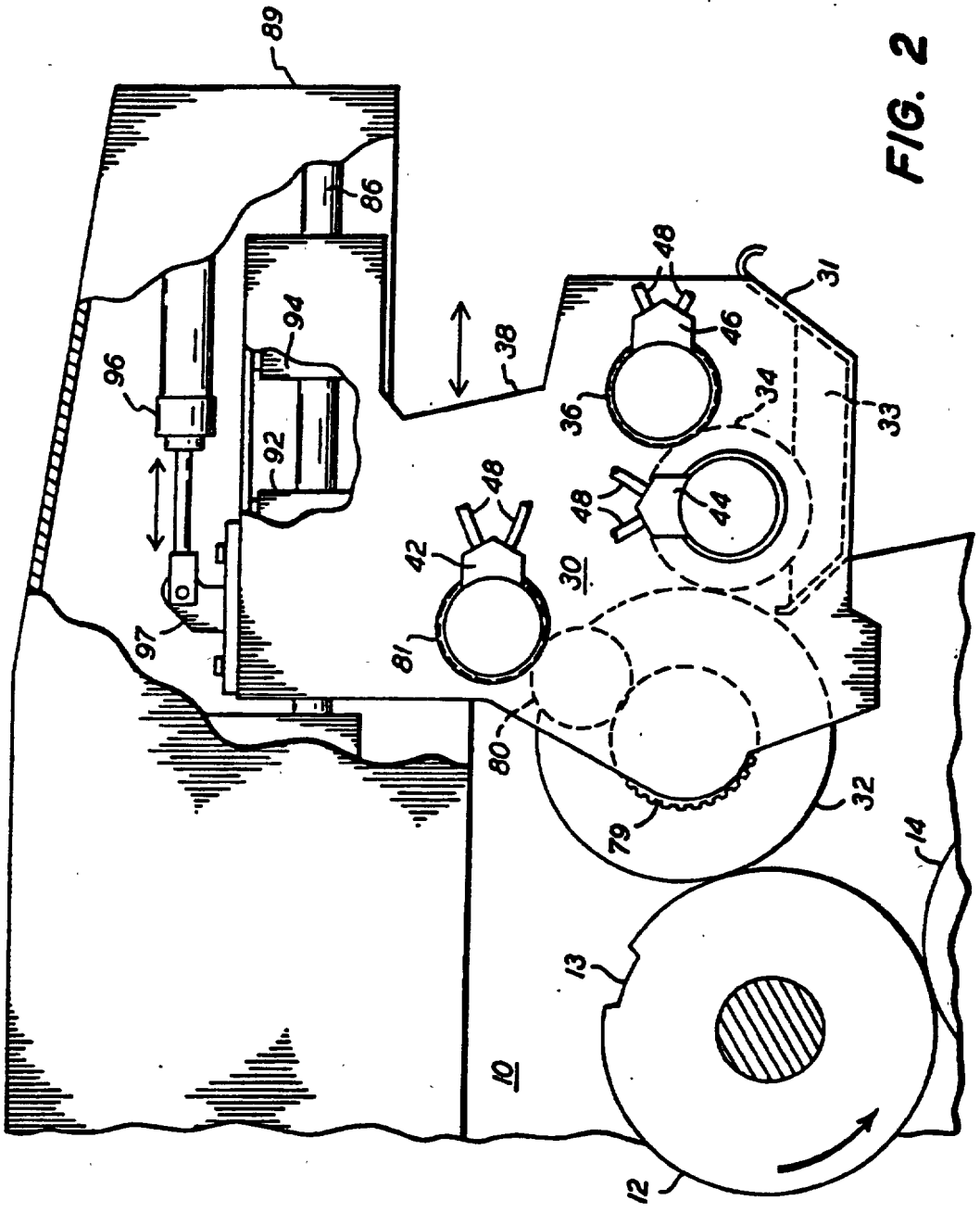
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FIG. 2

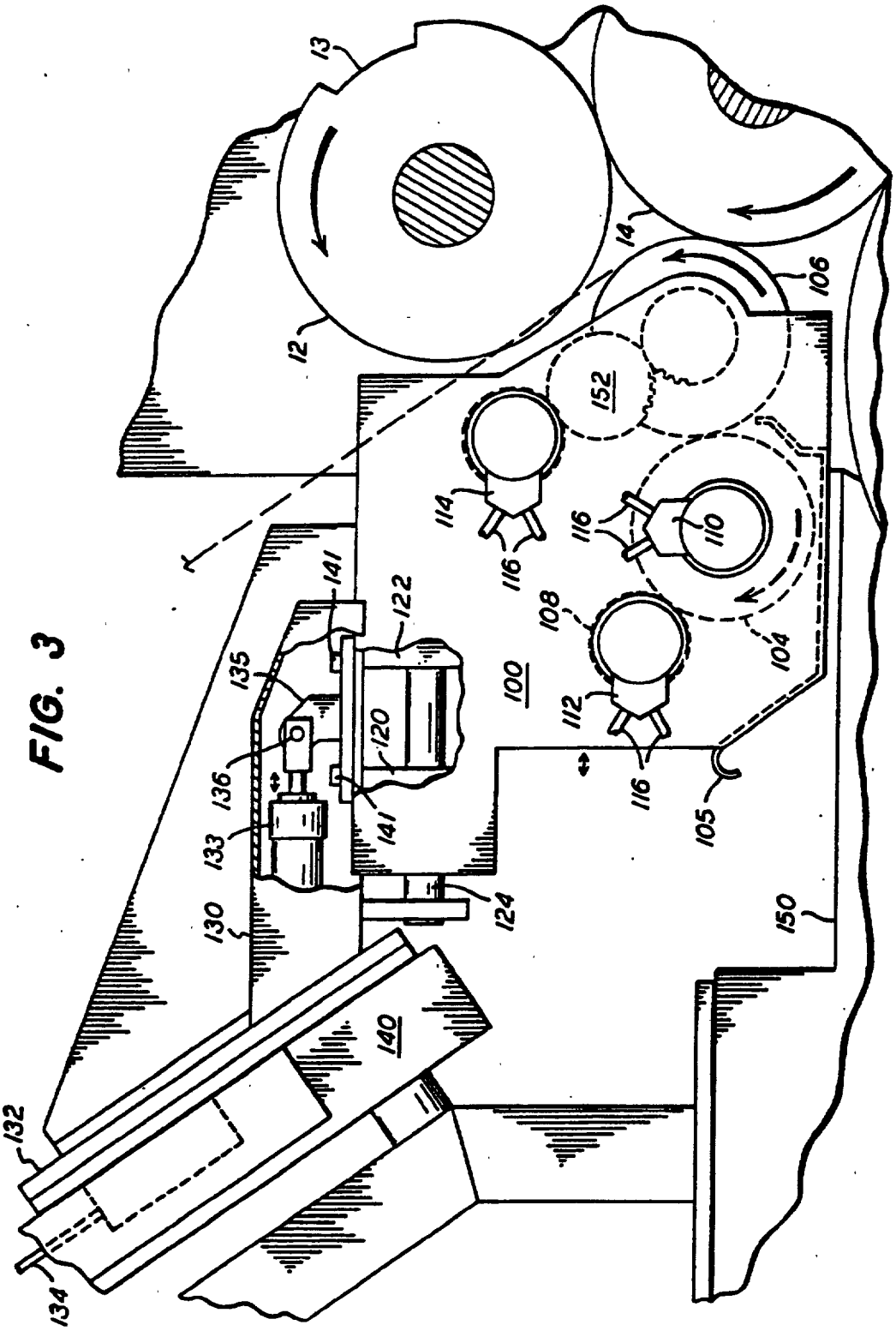
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FIG. 3

TWO HEADED COATER

This invention relates in general to coating apparatus for printing presses, and more particularly to a dual headed coater adapted to provide overall or spot coating on a printed sheet or web as a final or near final step in the printing process.

The advantages of coating printed sheets are well known, and much effort has been expended in providing satisfactory apparatus for carrying out the coating process. Among the many patents relating to coating apparatus are U.S. Pat. Nos. 4,615,293, 4,569,306, 4,685,414, 4,446,814, 4,421,027, 4,399,767, 4,397,237, 4,308,796, 4,270,483, and 3,931,791.

For flexibility and to reduce costs, printing presses are often assembled from a plurality of substantially identical printing units, the number of units used being determined by the number of colors to be printed. Each printing unit applies a different color ink to the sheet or web to form the printed image. It is advantageous, to reduce costs, and maintain flexibility in adapting the press to different jobs, to provide coating apparatus that may be selectively engaged with the plate or blanket cylinders of an existing printing unit to carry out the coating operation and disengaged so that the printing unit can be used for its normal purpose or allowed to idle when coating is not required.

Among the patents mentioned above, Jahn U.S. Pat. No. 4,615,293 shows a medium applicator for a printing machine. The medium applicator (coater) is disposed downstream of the printing units of the machine, and includes two applicator rollers, one contacting the roller that would function as the plate roller in a conventional printing unit and the other contacting the blanket cylinder. The coating rollers are disposed on the upstream side of the plate and blanket cylinders respectively of the coating assembly.

Although the coating apparatus described in the Jahn patent is theoretically capable of carrying out the spot and blanket coating operations as described, in practice, the arrangement shown in the Jahn patent is impractical, and would be of little use in a large scale printing application.

Printers can produce high volumes of printed material rapidly through the use of modern printing presses. The presses are extremely expensive, and the amount of time required to reconfigure the press from one job to another is non-productive, and costly. Accordingly, there is a need for presses and associated coating apparatus that minimize the time required to clean up from one run, and set up and commence the next run. Although versatile coaters that can apply spot and blanket coatings are desirable, ordinarily only one coater at a time is actually in operation. Where consecutive jobs require the same sort of coating, particularly blanket coating, it may not be necessary to clean up the coater between jobs. However, the coating lacquers cannot be allowed to dry on the rollers, and therefore, especially when switching from blanket to spot coating or vice-versa, or if there is a wait between jobs, it is necessary to clean up the coaters after each job is completed. In addition, cleanup is necessary when switching between different coating compositions, such as aqueous and u-v coatings. Such coatings are incompatible, and the coaters must be cleaned between applications of such different coatings.

Modern high speed printing presses are dangerous to work around in ordinary circumstances, and are particularly dangerous when operating at full speed. It would be virtually impossible to clean the prior art coaters such as the coater shown in the Jahn patent while the press is operating, and especially difficult for example to clean the blanket coater while printing spot coatings on a subsequent job.

Accordingly, it is an object of this invention to provide coating apparatus for applying continuous or spot coatings to an image printed surface comprising: a plate cylinder; a blanket cylinder for transferring a coating material from the plate cylinder to the copies; a blanket coating roller for transferring a continuous layer of coating material to the blanket cylinder; a plate coating roller for selectively applying spot coating material to the plate cylinder; first retracting means for moving the blanket coating roller laterally into and out of transferring engagement with the blanket cylinder; and second retracting means for moving the plate coating roller into and out of transferring engagement with the plate cylinder.

It is another object of this invention to provide coating apparatus of the type described and further including tachometer or other means responsive to the rotation of the plate and blanket cylinders for providing speed signals proportional to the press speed and control means responsive to the speed signals for controlling the speed of the plate and blanket coating rollers.

It is another object of this invention to provide drive means for the plate and blanket coating rollers, and independent controllers for each of the drive means permitting the relative speeds of the plate and blanket coating rollers and plate and blanket cylinders respectively, to be continuously controlled to adjust the shear at the nip between the rollers and the cylinders at various press speeds for enhancing the coating operation.

It is still another object of this invention to provide a retracting assembly for moving one of the plate and blanket coating rollers horizontally into and out of engagement with one of the plate and blanket cylinders, and for lifting the coating roller assembly away from the cylinder for easy access during cleaning.

It is still another object of this invention to provide means for translating the other coating roller into and out of engagement with the other cylinder, the out of engagement position adapted to permit cleaning of the roller and associated apparatus.

It is a still further object of this invention to provide control means responsive to sensing tachometers or other means providing signals proportioned to press speed coupled to the plate and blanket cylinders for controlling the rotation of the coating rollers and associated pick up and metering rollers for controlling the amount of coating material applied to the printed page.

It is a still further object of this invention to provide control means for incrementally adjusting the relative speed of the pickup, metering, and coating rollers relative to the speed of the plate and blanket cylinders.

It is a feature of this invention that coating rollers can be employed, because of the placement thereof on opposite sides of the press unit, that are larger in diameter than those utilized in prior art coaters. The use of large diameter coating rollers reduces the speed of rotation of the rollers, and thereby the tendency of the rollers to sling coating material off the surface by centrifugal force. This is especially advantageous in pattern or spotting coating operations, where the surface speeds of

the applicator roller and plate cylinder must be the same. The use of larger rollers reduces the centrifugal force produced at the surface of the applicator roller, thus greatly reducing the slinging or misting of coating material, when the present invention is employed. Slinging or misting of coating material greatly increases the difficulty of cleanup after a coating operation.

While the novel aspects of the invention are set forth with particularity in the appended claims, the invention itself, together with further objects and advantages thereof, may be more readily understood by reference to the following detailed description of the invention, taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a side elevation of a two headed coater in accordance with this invention;

FIG. 2 is an enlarged segmental side elevation of the plate coating assembly of the two headed coater of FIG. 1; and

FIG. 3 is a segmental side elevation of the blanket coating assembly of the two headed coater of FIG. 1.

Referring now to FIG. 1, a simplified view of a printing unit, preferably the last unit, of a multi-stage offset printing press is illustrated with the coating apparatus of the invention operatively associated therewith. The coating apparatus of this invention is specially adapted to allow it to be retrofitted to a variety of printing units, either during manufacture, or after a press has been installed in a print shop. The damping and inking systems employed in a conventional printing unit are not shown. They may be omitted if the coating unit is designed solely for coating, removed, or simply disengaged or not used in a printing unit retrofitted for coating in accordance with this invention. The unique construction of the two headed coater of this invention permits the coating rollers to be moved into contact with the plate cylinder and blanket cylinder of the converted printing unit, and to be withdrawn to accessible positions for cleaning when not in use.

Printing unit 10 includes a plate cylinder 12 and a counter rotating blanket cylinder 14. As used herein, plate and blanket cylinder refer to the assemblies including plates and blankets, and associated clamps and the like, that are disposed in recesses 13 and 15 shown schematically in the drawing for simplicity. Blanket cylinder 14 contacts an impression cylinder 16 under some pressure and the printed sheet is normally passed through the nip between the blanket and the impression cylinders in a manner well understood by those skilled in the art. Conventional drive means, including cylinder gear wheels, a main driver motor and associated controls, not shown, synchronize the rotation of the plate cylinder, blanket cylinder, and impression cylinder, with the rest of the press.

A controller 20 continuously monitors the press speed through the use of a speed sensor, such as tachometer 22, which may be an optical encoder having a wheel 24 arranged to bear against the plate cylinder (or the blanket cylinder if it is more accessible) for providing a continuous speed signal to controller 20. As used herein, the term tachometer is intended to encompass any device that provides a signal from which the relative speed of the press may be determined. Many presses incorporate such devices internally, and the outputs from internal tachometers of whatever sort are often suitable as speed signals for the coaters of the present invention.

Turning now to the spot coater assembly of the invention, the assembly 30 includes a coating roller 32, a pick up roller 34, and a metering roller 36, all journalled in a conventional fashion in a laterally translatable frame 38 as will be more fully described in connection with FIG. 2.

Referring to FIG. 2, pickup roller 34 is adapted to be at least partially immersed in a container 31 of coating material, such as lacquer 33. The container is omitted from FIG. 1 of the drawing, so as not to obscure the remaining elements. Pick up roller 34 rotates counter clockwise, and metering roller 36, by virtue of the spacing at the nip and the relative speed thereof with respect to the pickup roller, controls the amount of coating material transferred to the coating roller 32 from pickup roller 34. Spot coating assembly 30 is shown in its retracted position in FIG. 1. In this position the assembly is accessible for cleaning, even while the press is running. To this end, a work space is provided adjacent to the coating assembly on a platform 40 on which an operator may stand, to gain access to the spot coating assembly for service and cleaning.

Referring now to FIG. 2, the spot coater 30 is shown in its operating position with coating roller 32 engaging plate cylinder 12. Each of the rollers 32, 34, and 36 of the spot coating assembly 30 is driven by a separate hydraulic motor 42, 44 and 46 respectively. Conventional hydraulic lines 48 convey pressurized hydraulic fluid from a pump and controller valves to the motors and provide for a return to the pump (not shown). The control valves are connected to controller 20. A speed sensor is provided on each of hydraulic motors 42, 44 and 46. The speed sensors are connected to controller 20 via sensing lines 50, 52 and 54. Controller 20 preferably includes conventional displays such as digital for the press speed 60, metering roller speed 62, pickup roller speed 64, and plate coating roller speed 66. The speed of each of the metering, pickup and coating rollers is adjustable by means of controls 68, 70 and 72 respectively that are coupled to the controller valves. In addition, controller 20 is responsive to the press speed as sensed by tachometer 22 for correspondingly increasing or decreasing the speeds of the motors driving pickup, metering and coating rollers, so as to maintain synchronization with the press. It will be understood that synchronization does not necessarily mean that all of the rollers are driven in such a manner as to provide zero slip (relative speed) at the nips, but rather that the desired conditions, which may include relative shear at the nips, are maintained as the press speed is increased. In accordance with a presently preferred embodiment of the invention, the relative speeds of the rollers are set while the press is running at a low speed, and the controller 20 adjusts the speeds of the motors driving the pickup, metering and coating rollers, to maintain the same relative speed as the press speed increases. By adjusting controls 68, 70 and 72, the relative speeds may be fine tuned at any press speed.

As shown in FIG. 2, pickup roller 34 and metering roller 36 are driven directly by hydraulic motors 44 and 46 respectively, while coating roller 32 is driven indirectly by the motor via gear wheels 79, 80, and 81. Those skilled in the art will recognize that the precise manner in which the rollers are driven may be changed to accommodate different arrangements, the particular arrangement shown in FIG. 2 therefore representing only an example of a presently preferred embodiment of the invention.

Frame 38 of spot coating assembly 30 is laterally translatable on horizontally disposed traverse rod 86 rigidly mounted in a support 89, which is attached to coating unit 10. Frame 38 is attached to bearing blocks 92 and 94, that slidably engage rod 86. Linear hydraulic actuator 96 is attached to bracket 97 of frame 38 at one end, and to support 89 at the other, for laterally translating coating assembly 30 into and out of engagement with plate cylinder 12 as illustrated in FIGS. 1 and 2 respectively.

While plate coating assembly 30 is supported on a cantilevered arm of support 89 in accordance with a presently preferred embodiment of this invention, other functionally equivalent arrangements might be useful on printing stages having different configurations from the ones shown.

Referring now to FIGS. 1 and 3, the blanket coating assembly 100 of the invention is shown. Like the spot coating assembly, blanket coating assembly 100 includes a pickup roller 104 extending into a tray 105 adapted to contain a supply of coating liquid, such as lacquer or the like. Pickup roller 104 rotates clockwise and transfers the coating liquid onto blanket coating roller 106 in an amount determined by metering roller 108. The pickup, metering and blanket rollers are driven by hydraulic motors 110, 112 and 114 respectively, either directly or via gear wheels in like manner to the plate coater already described. The motors are supplied with pressurized hydraulic fluid through lines 116 in the manner already described in connection with the plate coating assembly 30. Similarly, speed sensors, not shown, are operatively engaged with each of the rollers or the motors to provide feedback signals representing the rotational speed of the rollers.

Blanket coating assembly 100 is carried by bearing blocks 120 and 122 slidably mounted on traverse rod 124, which is rigidly attached to cantilever arm 130 of carriage 132. Linear hydraulic actuator 133 has one end 136 coupled to a bracket 138, which is attached to blanket coating assembly 100 by bolts 141, or in other convenient fashion. Operation of actuator 134 translates plate coating assembly 100 into and out of engagement with blanket cylinder 14. Carriage 132 is attached to lifting cable 134, which extends up track 140 to conventional lifting means (not shown) to permit blanket coating assembly 100 to be raised to the position shown in phantom in FIG. 1, for cleaning or other servicing. Conventional means, such as a linear hydraulic actuator attached to cable 134, are employed to pull carriage 132 to the raised position. It will be appreciated by reference to FIG. 3, that it is necessary to laterally translate assembly 100 to the left before raising the carriage, in order that blanket coating roller 106 will clear the periphery of plate cylinder 12, as the carriage is raised.

When the carriage is raised, space is created on platform 150 for an operator to service blanket coating assembly 100.

It will be understood that a second controller unit similar to controller 20 is provided for controlling the rotation of pickup roller 104, metering roller 108 and coating roller 106. This controller is not shown in the drawings, because the connections thereto would obscure the remaining elements of the invention and are in any event identical to those already shown and described in connection with the plate coater. As was the case in connection with spot coater 30, hydraulic motor 14 drives coating roller 106 through an intermediate gear 152 in conventional fashion.

While the invention has been described in connection with a presently preferred embodiment thereof, those skilled in the art will recognize that certain modifications and changes may be made therein without departing from the true spirit and scope of the invention, which accordingly is intended to be defined solely by the appended claims.

What is claimed is:

1. Coating apparatus for applying continuous or spot coatings to a plate cylinder and a blanket cylinder of a printing press in which the plate cylinder is disposed generally above the blanket cylinder and arranged so that either of a plate coater and a blanket coater can be serviced while the other coater is operating;

a retractable blanket coater disposed on one side of the plate and blanket cylinders for transferring a layer of coating material to the blanket cylinder;

a retractable plate coater disposed on a side of the plate and blanket cylinders opposite the blanket coating roller for applying coating material to said plate cylinder;

blanket coater retracting means for moving said blanket coater between an operating position in contact with said blanket cylinder and a service position out of contact with the blanket cylinder;

plate coater retracting means for moving said plate coater between an operating position in contact with said plate cylinder and a service position out of contact with the plate cylinder; and

lifting means for lifting the blanket coater away from the blanket cylinder so that when one of the plate and blanket coaters is operating and the other is out of contact, the out of contact coater may be serviced without interfering with the operation of the operating one of the plate and blanket coaters.

2. The coating apparatus of claim 1 in which the plate coater comprises a plate coating roller and in which the blanket coater comprises a blanket coating roller and a plate coater motor for rotating said plate coating roller; a blanket coater motor for rotating the blanket coating roller; and also comprising

speed sensor means for providing a press speed signal; and

control means responsive to the press speed signal for controlling the speed of the plate coater motor and the blanket coater motor.

3. The coating apparatus of claim 2 wherein sid speed sensor means comprises tachometer means coupled to one of the plate cylinder and the blanket cylinder.

4. The coating apparatus of claim 2 further comprising a pickup roller for transferring a coating liquid to the plate coating roller and a metering roller for controlling the amount of coating liquid transferred to the plate coating roller.

5. The coating apparatus of claim 4 further comprising motor means for rotating the pickup roller and the metering roller.

6. The coating apparatus of claim 5 wherein said control means is connected to sid motor means for varying the speed of the pickup roller and the metering roller in response to the press speed signal.

7. The coating apparatus of claim 2 further comprising a pickup roller for transferring a coating liquid to the blanket coating roller and a metering roller for controlling the amount of coating liquid transferred to the blanket coating roller.

8. The coating apparatus of claim 7 further comprising motor means for rotating the pickup roller and the metering roller.

9. The coating apparatus of claim 7 wherein said control means is connected to said motor means for varying the speed of the pickup roller and the metering roller in response to the press speed signal.

10. Coating apparatus for a printing press including a plate cylinder and a blanket cylinder, comprising:

a coating assembly including a coating roller engaging one of the plate cylinder and the blanket cylinder, a pickup roller engaging the coating roller, and a metering roller; drive motors coupled to each of the coating roller, the pick up roller and the metering roller; and

speed sensor means coupled to a printing press and responsive to the speed of the press and coupled to the drive motors for independently controlling the rotational speeds of at least two of the coating roller, the pickup roller and the metering roller.

11. The coating apparatus of claim 10 in which the speed sensor means comprises a tachometer coupled to the press.

12. The coating apparatus of claim 11 in which the tachometer is coupled to the plate cylinder of the press.

13. The coating apparatus of claim 10 comprising individual speed controllers for each of the drive motors, so that the relative speed at the nip between any two adjacent rollers can be adjusted.

14. The coating apparatus of claim 13 further comprising means for maintaining the relative speeds of the pickup, metering and coating rollers as the press speed varies.

* * * * *

4

US005335596A

United States Patent [19]

DeMoore et al.

[11] Patent Number: 5,335,596

[45] Date of Patent: * Aug. 9, 1994

[54] **COATING APPARATUS FOR SHEET-FED, OFFSET ROTARY PRINTING PRESSES**

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[73] Assignee: **Howard W. DeMoore**, Dallas, Tex.

[*] Notice: The portion of the term of this patent subsequent to May 4, 2010 has been disclaimed.

[21] Appl. No.: **52,763**

[22] Filed: **Apr. 26, 1993**

Related U.S. Application Data

[63] Continuation of Ser. No. 879,841, May 6, 1992, Pat. No. 5,207,159, which is a continuation-in-part of Ser. No. 752,778, Aug. 30, 1991, Pat. No. 5,176,077.

[51] **Int. Cl.**[5] **B41F 31/00**

[52] **U.S. Cl.** **101/350**; 101/351; 101/367; 101/147; 118/261

[58] **Field of Search** 101/350, 351, 352, 137, 101/147, 148, 157, 167, 169, 207, 208, 219, 329, 330, 331, 348, 349, 364, 365, 366, 367; 118/602, 612, 236, 242, 259, 261, 262

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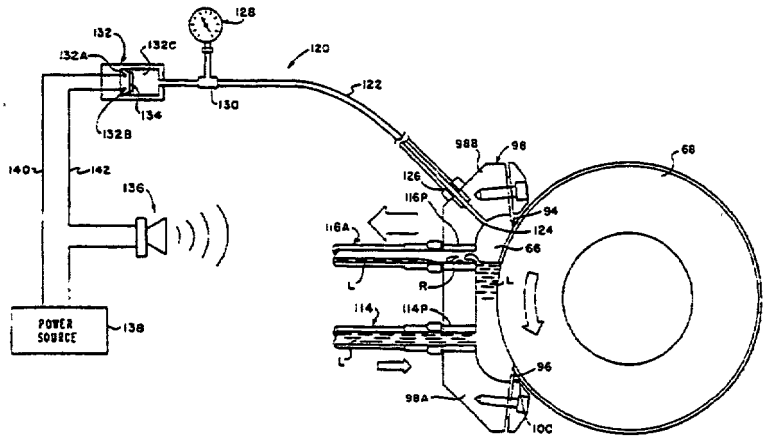
Primary Examiner—Eugene H. Eickholt

Attorney, Agent, or Firm—Dennis T. Griggs

[57] **ABSTRACT**

A coating apparatus for use in a sheet-fed or web-fed, offset rotary or flexographic printing press to apply a protective and/or decorative coating to the surface of freshly printed sheets includes a doctor blade coating unit coupled to a pickup roller for supplying liquid material from a reservoir to the surface of a pickup roller mounted on a press delivery drive shaft. Liquid material is circulated through the reservoir of the doctor blade unit by suction flow produced by a return pump. This prevents the buildup of a positive pressure differential within the doctor blade reservoir. The doctor blade reservoir is maintained at below ambient pressure level, thereby preventing leakage through the end seals. A vacuum sensor circuit provides a visual indication of air vacuum pressure in the doctor blade reservoir chamber, and a vacuum sensor switch applies electrical power to an audio transducer. The audio transducer produces an audible alarm in response to an increase in doctor blade chamber pressure, thereby providing advance warning of an impending end seal failure or a worn doctor blade condition.

10 Claims, 9 Drawing Sheets



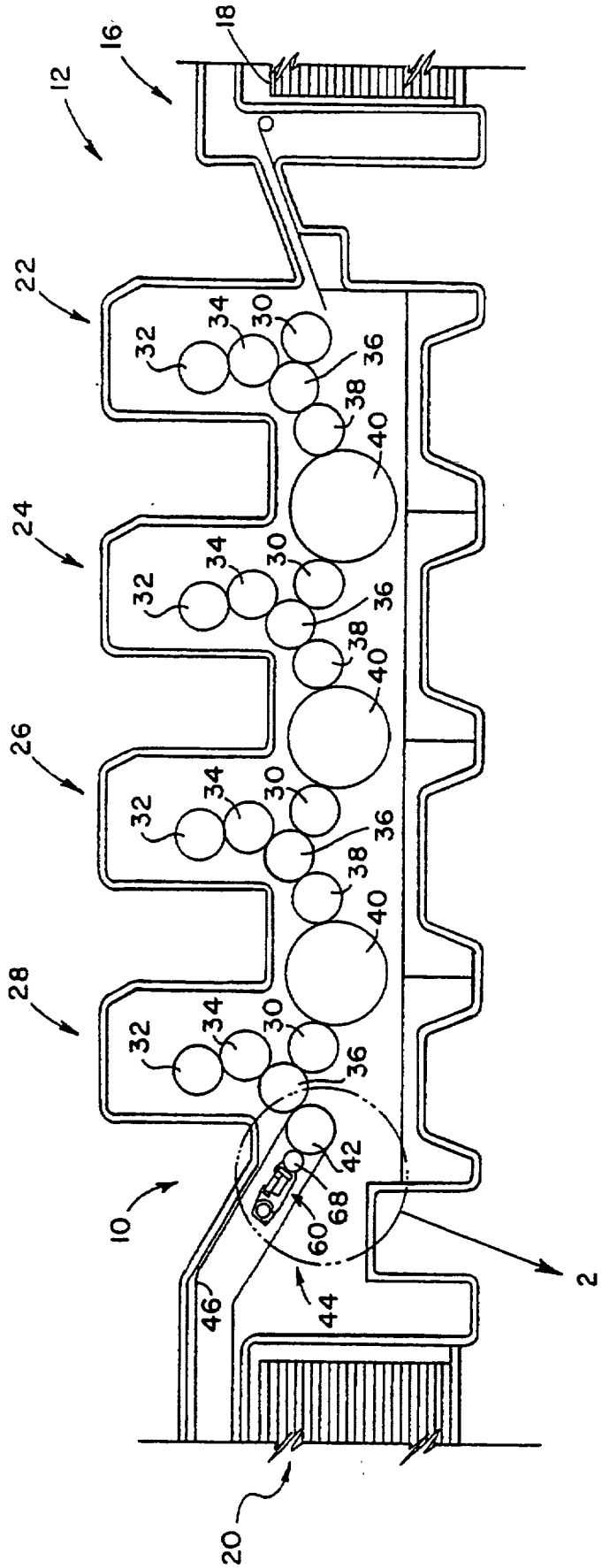


FIG. 1

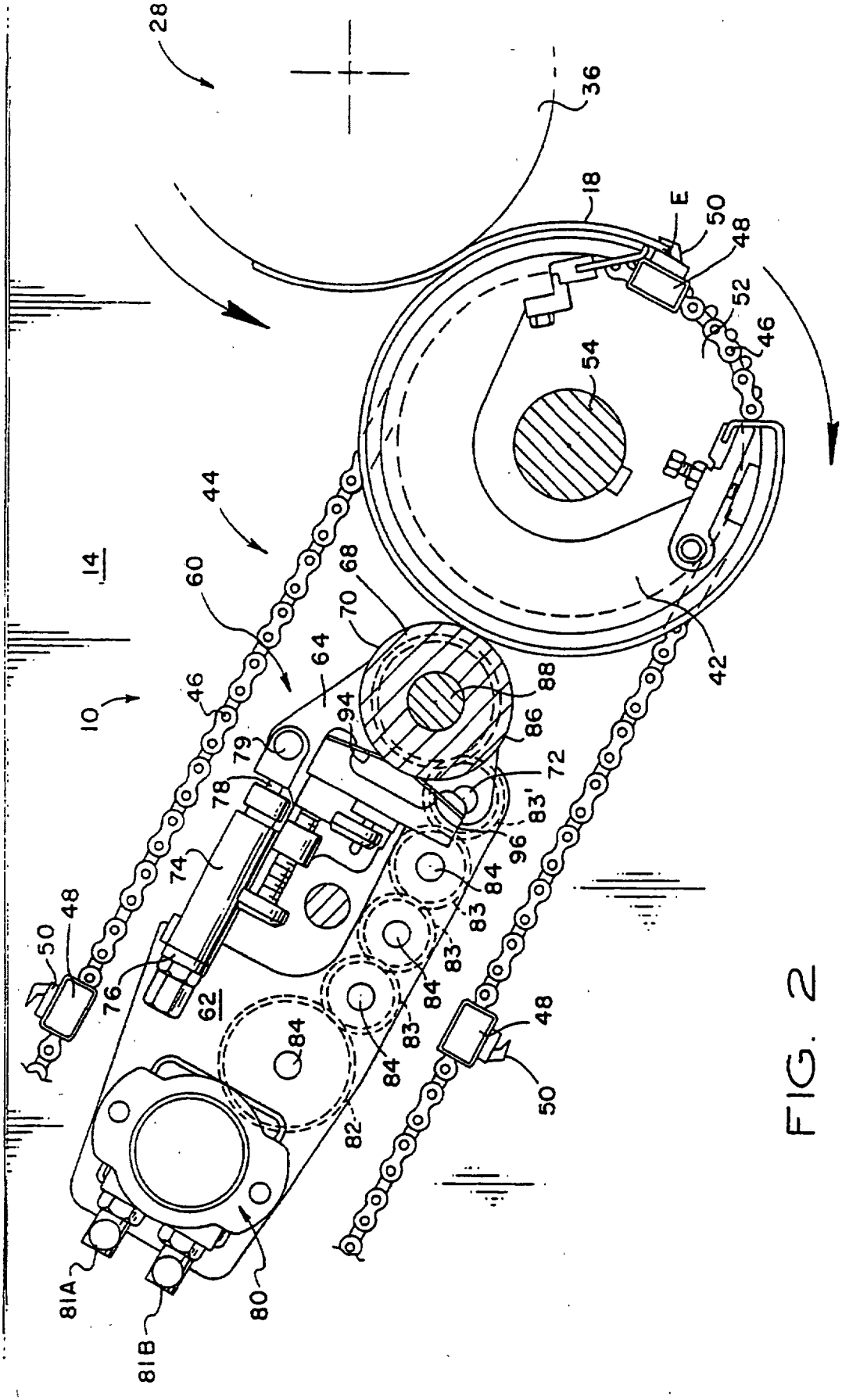

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FIG. 2

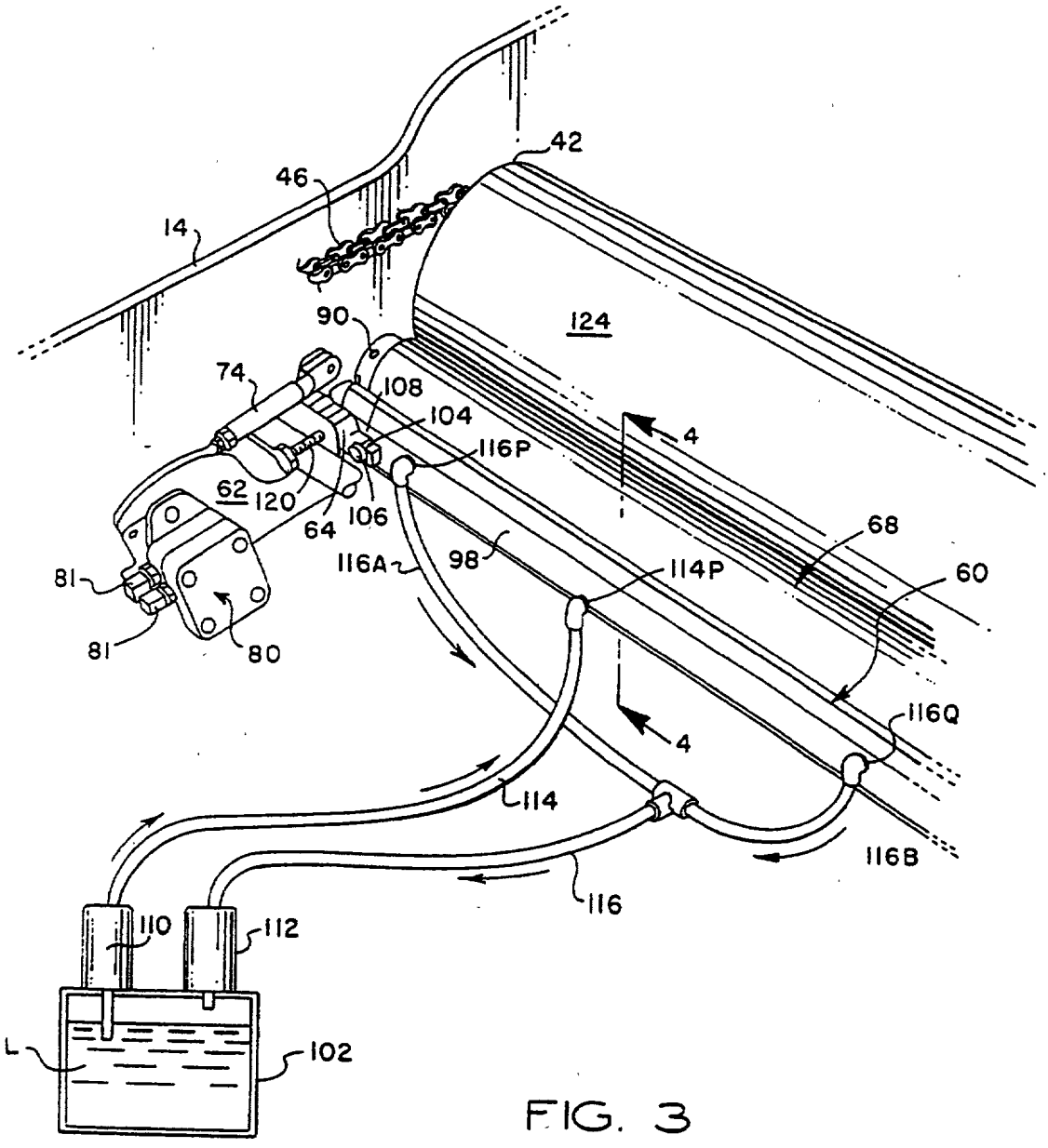
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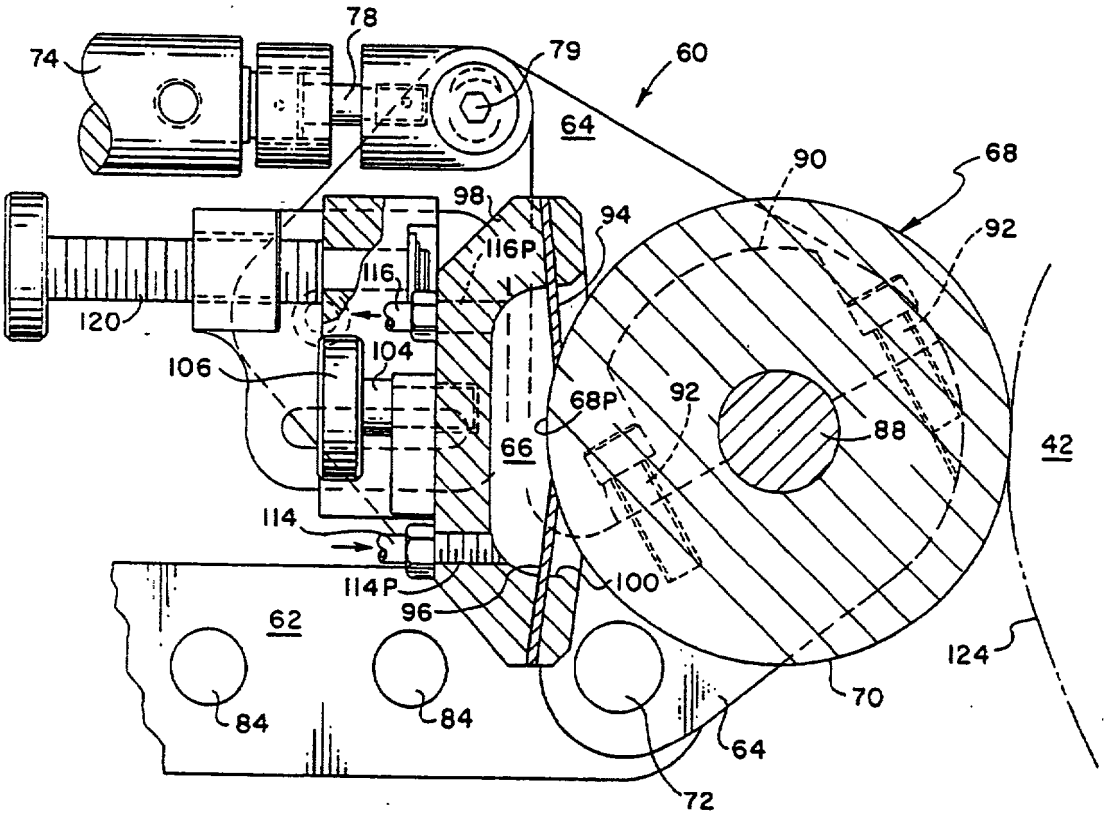
FIG. 3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100
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72

FIG. 4

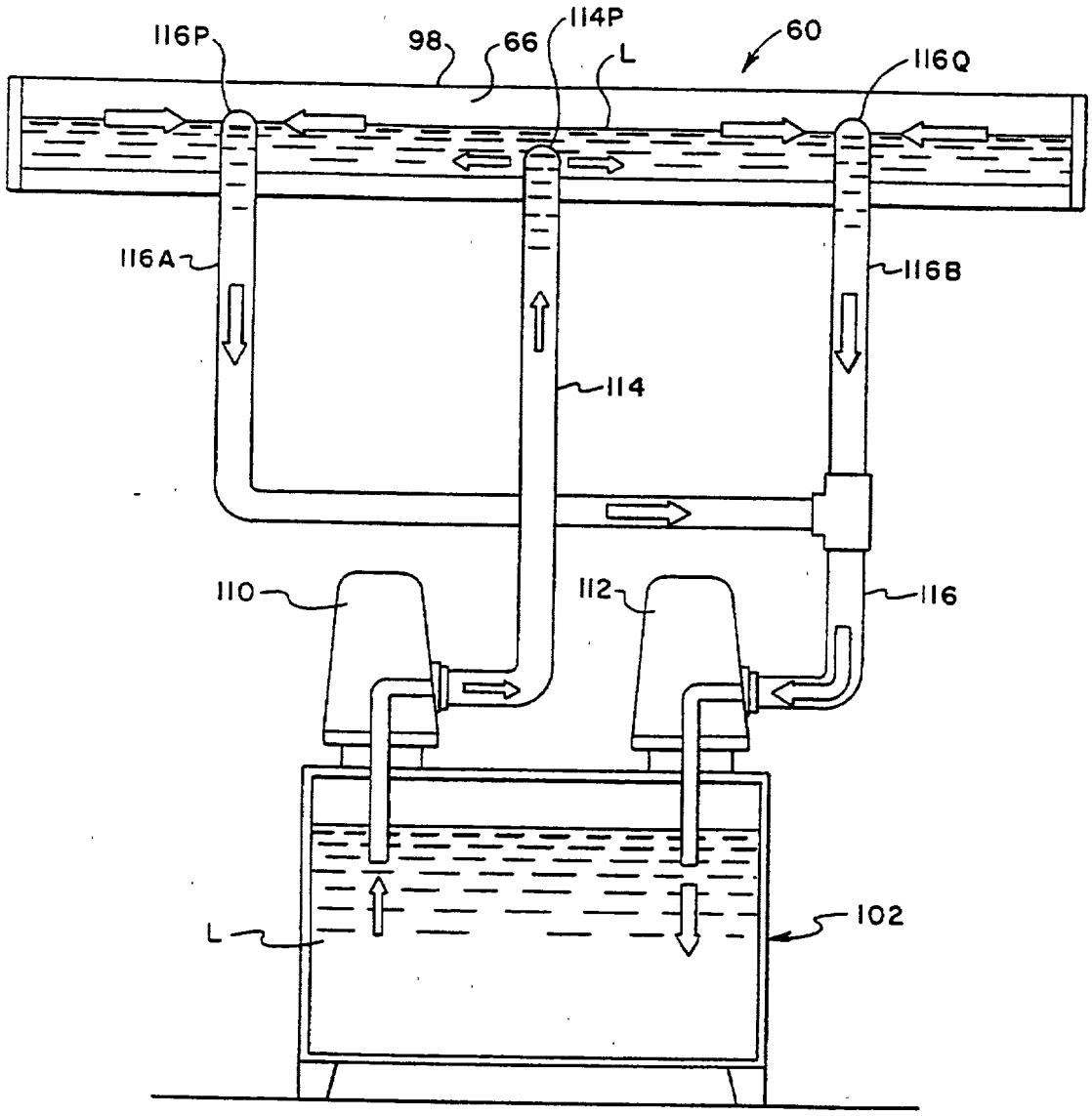


FIG. 5

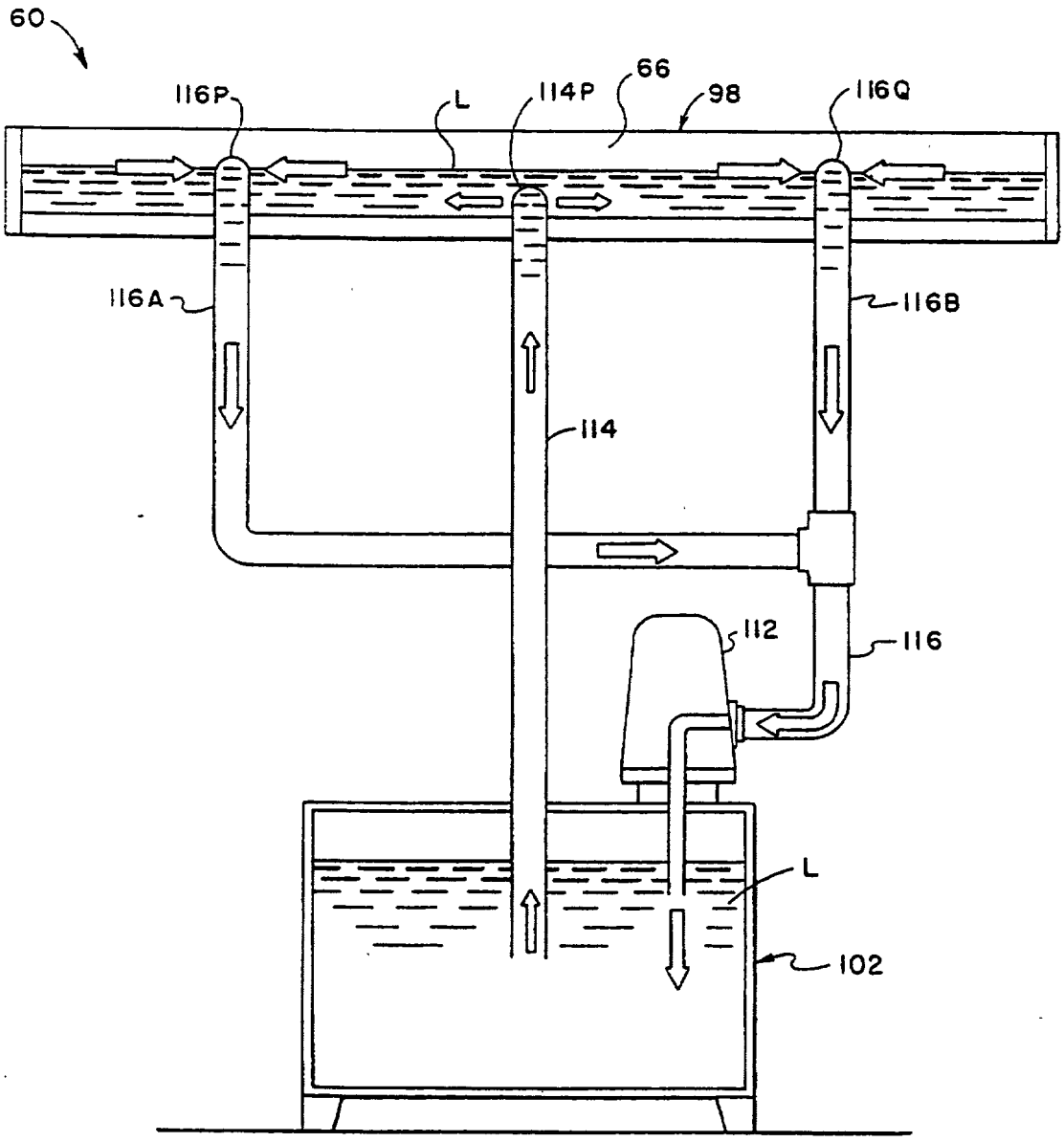


FIG. 6

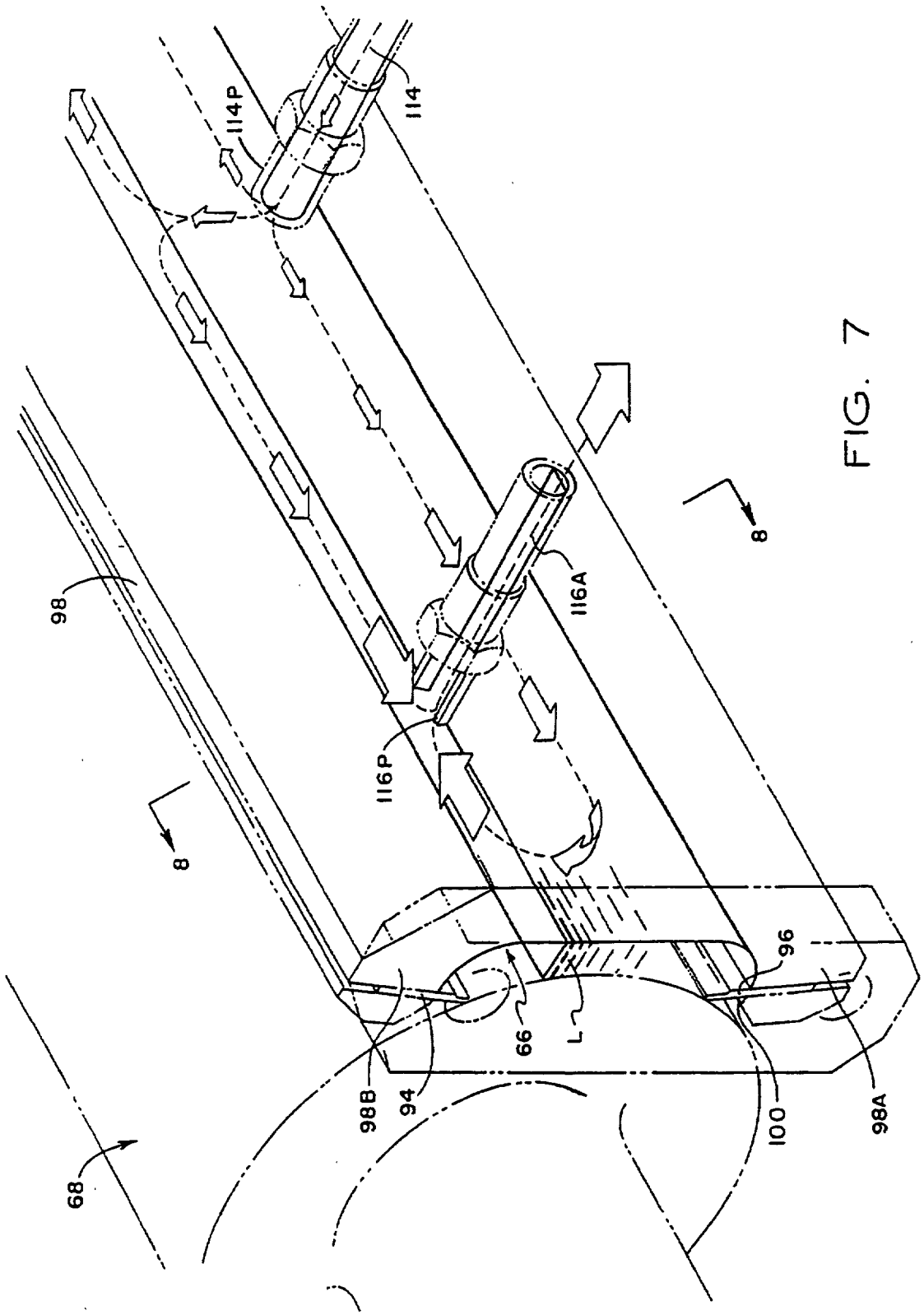


FIG. 7

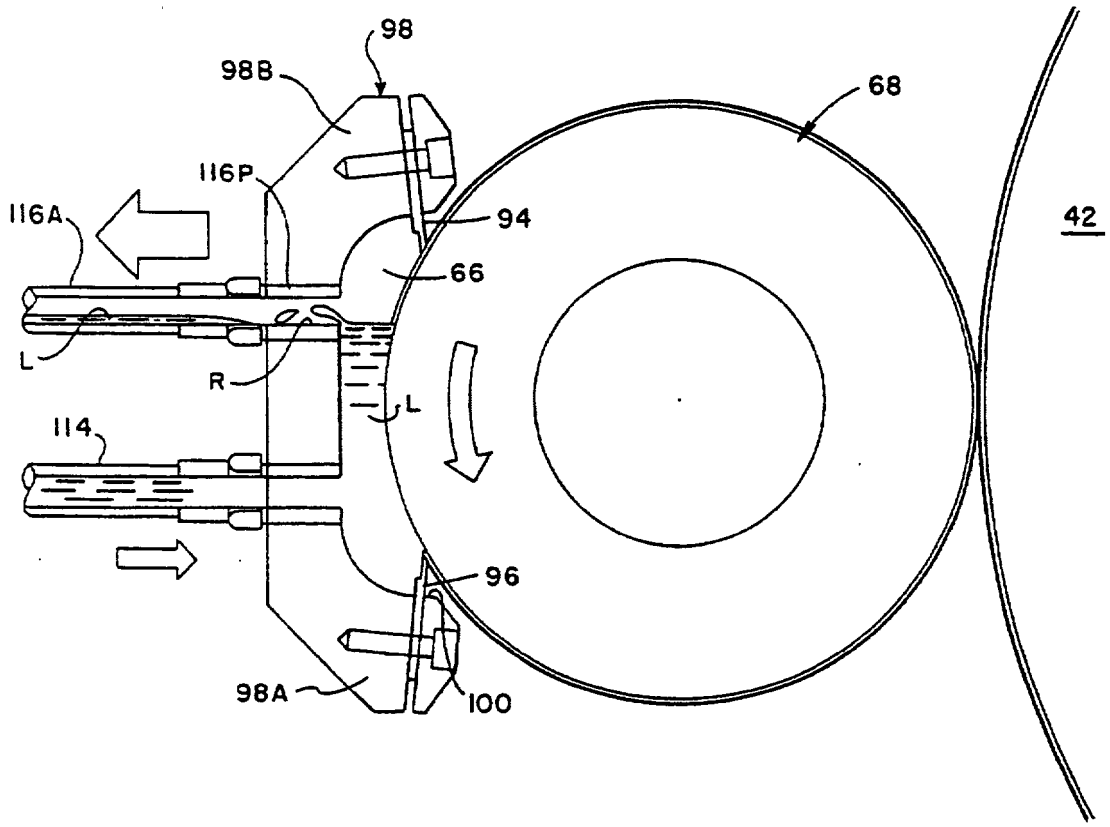
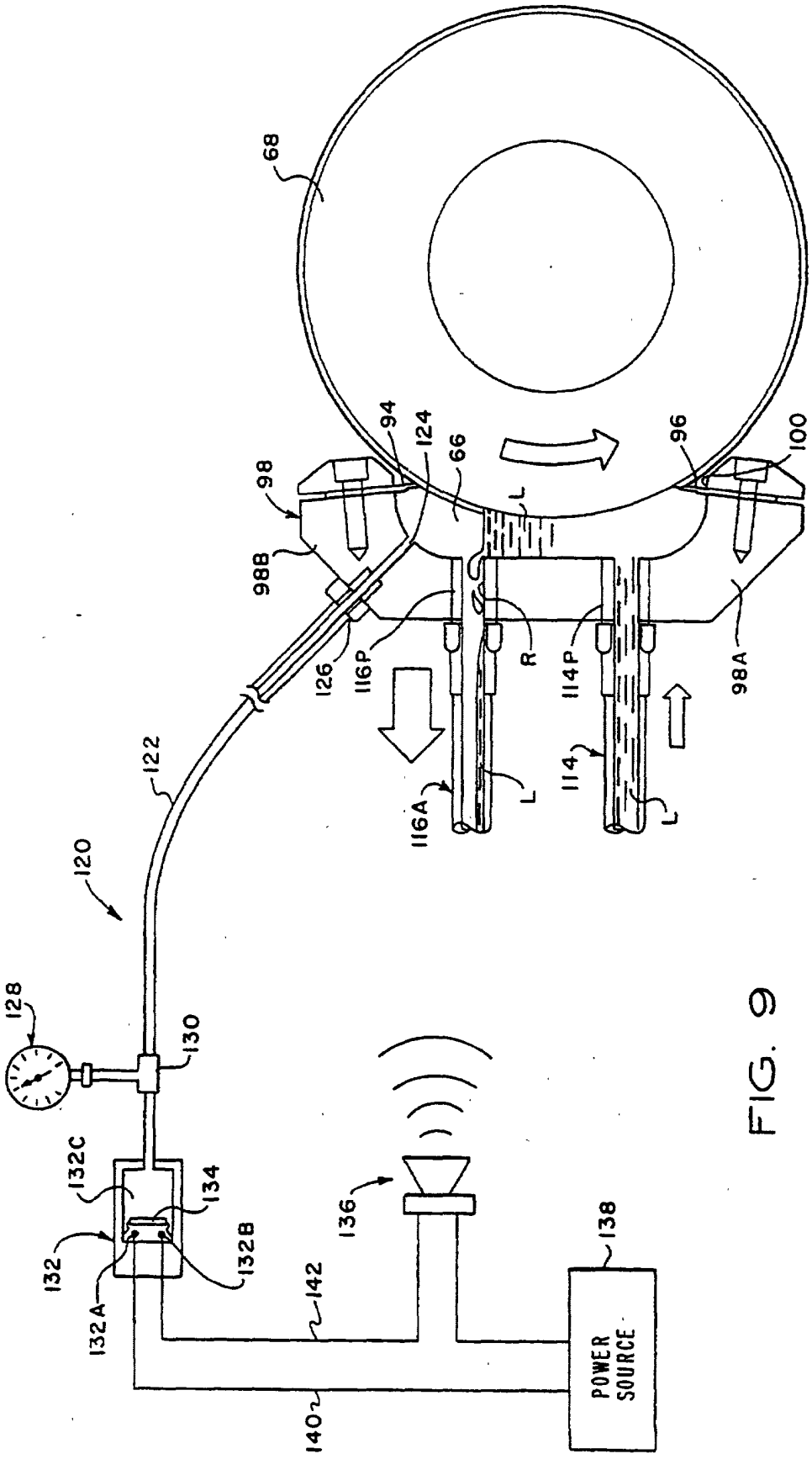


FIG. 8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116A
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128
130
132C
134
136
138
132
1328
142
132A
POWER SOURCE
140

FIG. 9

COATING APPARATUS FOR SHEET-FED, OFFSET ROTARY PRINTING PRESSES

CROSS REFERENCE TO RELATED APPLICATION

This is a continuation of application Ser. No. 07/879,841, filed May 6, 1992 now U.S. Pat. No. 5,207,159 which is a continuation-in-part of application Ser. No. 07/752,778 filed Aug. 30, 1991 now U.S. Pat. No. 5,176,077.

FIELD OF THE INVENTION

This invention relates to sheet-fed or web-fed, offset rotary or flexographic printing presses, and more particularly, to a new and improved apparatus for the in-line application of protective and decorative coatings or inks to the printed surface of freshly printed sheets or web.

BACKGROUND OF THE INVENTION

Conventional sheet-fed, offset rotary printing presses typically include one or more printing stations through which individual sheets are fed and printed with wet ink. After final printing, the sheets are fed by a delivery conveyor system to the delivery end of the press where the freshly printed sheets are collected and stacked. In a typical sheet-fed, offset rotary printing press such as the Heidelberg Speedmaster line of presses, the delivery conveyor system includes a pair of endless gripper chains carrying spaced laterally disposed gripper bars and grippers which are used to grip and pull freshly printed sheets from the impression cylinder and convey the sheets toward the sheet delivery stacker. The gripper chains are driven in precisely timed relation to the impression cylinder by gripper chain sprocket wheels which are laterally spaced between a delivery drive shaft mounted on opposite sides of the press frame. The delivery drive shaft is mechanically coupled by gears for synchronous rotation with the impression cylinder.

Since the inks used with offset type printing presses typically remain wet and tacky for some time after printing, special precautions must be taken to insure that the wet inked surface of the freshly printed sheets is not marked or smeared as the sheets are transferred from one printing station to another, and through the delivery system to the sheet delivery stacker. The printed surface of the paper dries relatively slowly and can be smeared during subsequent processing, particularly when the printed sheets are stacked. In order to minimize smearing, a dryer may be mounted along the delivery path of the printed sheets, or an anti-offset spray powder may be sprayed on the printed surface.

In some printing applications, it is desirable that the press be capable of applying a protective and/or decorative coating over all or a portion of the surface of the printed sheets. Typical coating solutions include varnish, lacquer, dye, moisturizers and ink. Such coatings typically are formed of a UV-curable or water-soluble resin applied as a liquid solution or emulsion by an applicator roller over the freshly printed sheets to protect the ink and improve the appearance of the sheets. Use of such coatings is particularly desirable when decorative or protective finishes are required such as in the production of posters, record jackets, brochures, magazines, folding cartons and the like. In cases where a liquid coating is to be applied, the coating operation is carried out after the final ink printing has been performed, most desirably by an in-line coating application.

DESCRIPTION OF THE PRIOR ART

Various suggestions have been made for applying the coating as an in-line press operation by using the final printing station of the press as the coating application station. For example, in U.S. Pat. Nos. 4,270,483, 4,685,414 and 4,779,557, there are disclosed coating apparatus which can be moved into position to allow the blanket cylinder of the last printing station of a press to be used to apply a coating material to the sheets. In U.S. Pat. No. 4,796,556, there is disclosed a coating apparatus which can be selectively moved between the blanket cylinder or the plate cylinder of the last printing station of the press so that the station can be used as a coating station for the press.

Suggestions for overcoming the problem of the loss of a printing station when coating is desired have also been made, such as that set forth in U.S. Pat. No. 4,934,305 which discloses a coating apparatus having a separate timed applicator roller positioned to apply the coating material to the printed sheet while the sheet is on the last impression cylinder of the press. This is said to allow the last printing station to be operated simultaneously as both an ink application station and a coating station so that no loss of press printing unit capability results. Another approach to providing a coating station without losing the printing capabilities of the last printing station is to provide a totally separate coating unit downstream of the last printing station so that the coating is applied to the sheets after final printing and before the sheets have reached the sheet delivery stacker. Such an approach is suggested in U.S. Pat. Nos. 4,399,767 and 4,706,601.

Conventional coating apparatus which is operable as an in-line press operation utilizes an engraved transfer roller, with the liquid coating being applied to the engraved roller by means of a doctor blade assembly. The doctor blade assembly includes an elongated housing having a reservoir chamber extending the length of the transfer roller for holding a volume of coating liquid in wetting contact with the circumferential surface of the transfer roller. A pair of circumferentially spaced doctor blades extend longitudinally along the reservoir housing on either side of the chamber. The doctor blades are angled tangentially toward the transfer roller surface, and seal the reservoir chamber against the roller surface and wipe the roller surface to deposit liquid in the cells of the engraved transfer surface.

The reservoir chamber is pressurized with coating liquid, which is pumped from a remote supply drum into the upper region of the pressure chamber. After the pressure chamber fills to a certain level, it is returned to the remote drum by gravity flow. Occasionally, the doctor blade reservoir chamber becomes completely filled with the coating liquid when the volume of coating liquid being delivered to the doctor blade reservoir chamber exceeds the gravity flow return rate. The positive pressure may cause the seals at the ends of the roller to leak, allowing the coating liquid to drip onto the floor or onto adjacent press parts. Occasionally, the coating liquid may be slung from the roller onto adjacent press equipment and operator areas. Moreover, the buildup of positive pressure within the doctor blade reservoir chamber accelerates the wear of the end seals.

It will be appreciated that the transfer roller may be operated at high speeds, for example, on the order of

1,000 linear feet per minute, and that the end seals of the doctor blade assembly will tend to wear quickly. The end seal wear is accelerated by the buildup of positive pressure within the doctor blade chamber. Low volume drip leakage can be collected in a drip pan or catch tray, but as the end seals wear, the coating liquid will be slung from the transfer roller, thereby causing a difficult cleanup problem. When this occurs, the press must be shut down, the doctor blade head must be removed, and the end seals replaced. The steps of rebuilding or replacing the end seals and realigning the doctor blade head causes an unacceptable amount of press downtime.

One approach for overcoming the problem of end seal wear is to provide stationary end seals which are mounted on the press frame, and which bear in sealing engagement against the ends of the transfer roller, so that the doctor blade head may form a seal with stationary seals rather than with the dynamic seals carried on the transfer roller. Another approach is to use rotary end seals which include an end plate which is resiliently engaged against the end surface of the transfer roller, with a seal member being secured between the end plate and the end portions of the roller by quick removal mounting lugs.

While the foregoing mechanical approaches to limiting end seal wear and thereby avoiding leakage have been moderately successful, and some arrangements have reduced downtime by quick change mounting features, the end seals nevertheless are still experiencing accelerated wear and early failure, thereby causing frequent replacements and unacceptable downtime for correction of end seal leakage.

OBJECTS OF THE INVENTION

Accordingly, there exists a need for a new and improved in-line coating apparatus for use in a sheet-fed or web-fed, offset rotary or flexographic printing press for applying a protective and/or decorative coating to the printed surface of freshly printed sheets which does not require any expensive or substantial press modification or result in any impairment of normal press operating capability.

Specifically, the principal object of the present invention is to provide a new and improved in-line coating and/or inking apparatus of the character described which achieves a reduction in end seal leakage.

SUMMARY OF THE INVENTION

The present invention provides a new and improved in-line doctor blade apparatus for applying a protective and/or decorative coating and/or inking to the surface of freshly printed sheets in a sheet-fed or web-fed, offset rotary or flexographic printing press which is highly reliable and effective in use, yet which does not require any expensive or substantial press modification or result in any impairment of normal press operating capability.

The reservoir of a doctor blade head is supplied with coating material from a remote supply drum. To insure that an adequate supply of coating liquid is always present within the doctor blade reservoir, the coating material is drawn from the remote supply drum and is circulated by suction flow constantly through the reservoir. In contrast to the conventional approach of positively pressurizing the doctor blade reservoir with liquid coating pumped from the remote drum to the reservoir, the coating material is instead circulated through the reservoir by suction flow. That is, instead of charging the reservoir with coating liquid pumped from the remote drum and thereby creating a positive pressure condition within the doctor blade reservoir, circulation through the reservoir is induced by suction flow provided by a suction pump having an input connected for drawing coating liquid from the doctor blade reservoir, and returning it by forced (positive pressure) flow to the remote supply drum, rather than by gravity flow return.

As a result of the suction flow arrangement, the liquid material is drawn from the remote supply drum at a greater rate than the rate of withdrawal of the liquid material by the pickup roller, and a substantially constant supply of liquid material will always be present within the doctor blade reservoir. A benefit of the suction flow arrangement is that a positive pressure buildup does not occur within the doctor blade chamber. Moreover, liquid material which rises above a predetermined fill level is drawn out of the doctor blade reservoir by the suction pump, and is returned to the remote drum. Consequently, the end seals are not subjected to high pressure differential conditions. Instead, the suction flow arrangement produces a negative pressure differential, with the doctor blade chamber being operated at a level below atmospheric. Under negative pressure conditions, leakage of coating liquid is virtually nonexistent, and the operating life of the end seals is substantially increased.

According to another aspect of the present invention, visual and audible alerts are provided by a vacuum sensor line which is coupled to the vacuum space within the doctor blade chamber. The sensor line is coupled to a vacuum gauge which provides a visual indication of the suction pressure within the doctor blade chamber. A vacuum sensor switch is also coupled to the chamber for selectively applying electrical power to an audio transducer when the pressure within the vacuum chamber rises above a predetermined safe operating suction level.

Other features and advantages of the present invention will become more apparent from the following detailed description taken in conjunction with the accompanying drawings which disclose, by way of example, the principles of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic side elevational view of a sheet-fed, offset rotary printing press having a coating apparatus embodying the present invention;

FIG. 2 is an enlarged fragmentary side elevational view taken substantially within the circular area designated "2" in FIG. 1 and showing the coating apparatus of the present invention during coating operation;

FIG. 3 is an enlarged fragmentary perspective view showing one side of the coating apparatus mounted in the press and illustrating the fluid path of coating material from a remote supply drum to the doctor blade reservoir of the coating unit;

FIG. 4 is an enlarged fragmentary sectional view taken substantially along the line 4—4 of FIG. 3;

FIG. 5 is a simplified flow diagram which illustrates a dual pump arrangement for circulating coating liquid from a remote supply drum to the doctor blade reservoir and return;

FIG. 6 is a simplified flow diagram which illustrates a single pump arrangement for circulating coating liquid by suction flow from a remote supply drum to the doctor blade reservoir and return;

FIG. 7 is an enlarged fragmentary perspective view of one end portion of the doctor blade coating apparatus of the present invention;

FIG. 8 is an enlarged sectional view taken substantially along the line 8—8 of FIG. 7; and,

FIG. 9 is a view similar to FIG. 8 which includes a suction pressure sensing circuit for providing a visual indication of suction pressure and an audible alert when the suction/vacuum pressure inside the doctor blade rises above a safe operating level, thereby signaling an impending end seal failure.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

As shown in the exemplary drawings, the present invention is embodied in a new and improved in-line doctor blade apparatus, herein generally designated **10**, for use in applying a protective and/or decorative coating or inks to the freshly printed surface of sheets printed in a sheet-fed or web-fed, offset rotary or flexographic printing press, herein generally designated **12**. In this instance, as shown in FIG. **1**, the doctor blade coating apparatus **10** is illustrated as installed in a four color printing press **12**, such as that manufactured by Heidelberger Druckmaschinen AG of the Federal Republic of Germany under its designation Heidelberg Speedmaster 102V (40"), and which includes a press frame **14** coupled at one end, herein the right end, with a sheet feeder **16** from which sheets, herein designated **18**, are individually and sequentially fed into the press, and at the opposite end, with a sheet delivery stacker **20** in which the finally printed sheets are collected and stacked. Interposed between the sheet feeder **16** and the sheet delivery stacker **20** are four substantially identical sheet printing stations **22**, **24**, **26** and **28** which can print different color inks onto the sheets as they are moved through the press **10**.

As illustrated, each of the printing stations **22**, **24**, **26** and **28** is substantially identical and of conventional design, herein including a sheet-fed cylinder **30**, a plate cylinder **32**, a blanker cylinder **34** and an impression cylinder **36**, with each of the first three printing stations **22**, **24** and **26** having a transfer cylinder **38** disposed to withdraw the freshly printed sheets from the adjacent impression cylinder and transfer the freshly printed sheets to the next printing station via a transfer drum **40**. The final printing station **28** herein is shown as equipped with a delivery cylinder **42** which functions to support the printed sheet **18** as it is moved from the final impression cylinder **36** by a delivery conveyor system, generally designated **44**, to the sheet delivery stacker **20**.

The delivery conveyor system **44** as shown in FIG. **2** is of conventional design and includes a pair of endless delivery gripper chains **46**, only one of which is shown carrying at regular spaced locations along the chains, laterally disposed gripper bars **48** having gripper elements **50** used to grip the leading edge of a sheet **18** after it leaves the nip between the delivery cylinder **42** and impression cylinder **36** of the last printing station **28**. As the leading edge E of the sheet **18** is gripped by the grippers **50**, the delivery chains **46** pull the sheet away from the impression cylinder **36** and convey the freshly printed sheet to the sheet delivery stacker **20** where the grippers release the finally printed sheet.

The endless delivery chains **46** are driven in synchronous timed relation to the impression cylinder **36** by sprocket wheels **52** fixed adjacent the lateral ends of a delivery drive shaft **54** which has a mechanically geared coupling (not shown) to the press drive system. The delivery drive shaft **54** extends laterally between the sides of the press frame **14** adjacent the impression cylinder **36** of the last printing station **28**, and is disposed to be parallel with the axis of the impression cylinder. In this instance, the delivery cylinder **42**, which is constructed to allow adjustments in diameter by suitable means, is attached to the delivery drive shaft **54** so that the delivery cylinder is also rotated in precise timed relation with the impression cylinder.

In this respect, it is important to note that when the freshly printed sheets **18** are conveyed away from the impression cylinder **36** of the final printing station **28** by the gripper **50** carried by the delivery chains **46**, the wet inked surfaces of the sheets face the delivery drive shaft **54** and the sheets must be supported such that the ink is not smeared as the sheets are transferred. Typically, such support is provided by skeleton wheels or cylinders mounted to the press delivery drive shaft **54**, or as is now more commonly used, net equipped delivery cylinders marketed by Printing Research, Inc. of Dallas, Tex. under its registered trademark SUPERBLUE. That system, which is made and sold under license, is manufactured in accordance with and operates as described in U.S. Pat. No. 4,402,267, issued Sep. 6, 1983, to Howard W. DeMoore, the disclosure of which is incorporated herein by this reference.

More recently, vacuum transfer apparatus of the type disclosed in co-pending application Ser. No. 07/630,308, filed Dec. 18, 1990, entitled "Vacuum Transfer Apparatus for Sheet-Fed Printing Presses", which is also incorporated herein by reference, has been used. The vacuum transfer apparatus disclosed in that application can be used in place of delivery cylinders or skeleton wheels to pull the unprinted side of the sheet away from the delivery drive shaft **54** so that the wet ink surface of the sheets do not come into contact with any press apparatus.

In accordance with the present invention, the in-line doctor blade coating apparatus **10** for applying the protective or decorative coating or ink to the sheets **18** enables the press **12** to be operated in the normal manner without the loss of the final printing station **28**, and without requiring any substantial press modifications by employing the existing press delivery drive shaft **54** as the mounting location for the coating applicator roller. In presses having delivery systems such as skeleton wheels mounted on the delivery drive shaft **54** or a vacuum transfer apparatus as disclosed in the aforementioned co-pending application Ser. No. 07/630,308, conversion to a coating operation can be quickly and easily achieved by mounting on the press delivery drive shaft in place of the skeleton wheels or in addition to the vacuum transfer apparatus, a suitable support cylinder capable of performing the combined function of a coating applicator roller and a net enhanced delivery cylinder **42**. By utilizing the delivery cylinder **42** mounted on the delivery drive shaft **54** to also act as a coating applicator roller, protective coating will be applied to the printed sheet **18** in precise timed registration, and will permit the press to be operated with its full range of printing stations.

Toward these ends, the coating apparatus **10** of the present invention includes a relatively simple, positive acting and economical doctor blade coating unit, generally designated **60**, mounted to the press frame **14** downstream of the delivery drive shaft **54** and positioned to apply liquid coating material to the support surface of a

delivery cylinder 42 mounted on the delivery drive shaft. As can best be seen in FIGS. 2, 3 and 4, the doctor blade coating unit 60 herein comprises a pair of side frames 62, only one of which is shown, it being understood that the other side frame is substantially the same as that of the side frame illustrated, attached to each side of the press frame 14. Pivotally mounted to one end of each of the side frames 62 is a support bracket 64 carrying one end of a liquid material reservoir 66 and cooperating liquid material pickup roller 68 each disposed to extend laterally across the press 12 parallel with the delivery drive shaft 54. The coating unit 60 is mounted between the upper and lower runs of the delivery chains 46 downstream of the delivery drive shaft 54, and positioned so that the outer peripheral surface 70 of the pickup roller 68 can be engaged with the support surface of a delivery cylinder 42 mounted on the delivery drive shaft.

As best seen in FIGS. 2 and 3, the support bracket 64 is pivotally attached to the end of the side frame 62 by a shaft 72 disposed at the lower end portion of the bracket, and can be pivoted about the shaft by an extensible cylinder 74, herein shown as a pneumatic cylinder, one end 76 of which is secured such as by welding to the side frame, and the opposite end 78 of which is coupled through a pivot shaft 79 to the upper end portion of the bracket. By extending or retracting the cylinder 74, the extent of engagement of the pickup roller 68 against the surface of the applicator roller 42 can be controlled, and the pickup roller can be completely disengaged from the applicator roller 42.

The coating pickup roller 68, which is of conventional design and preferably one such as the Anilox rollers manufactured by A.R.C. International of Charlotte, N.C. and sold under the name "PRINTMASTER" having an engraved ceramic or chrome outer peripheral surface 70, is designed to pick up a predetermined uniform thickness of liquid coating material or ink from the reservoir 66, and then uniformly transfer the coating material to the support surface of the applicator roller 42. To effect rotation of the pickup roller 68, a suitable motor 80, herein a hydraulic motor, is attached to one of the side frames 62 and coupled to a suitable hydraulic fluid source (not shown) through fittings 81A, 81B. Attached to the output of the motor 80 is an output gear which is drivingly coupled through a cluster gear 82 and a series of idler gears 83 each mounted on stub axles 84, to a drive gear 86 attached to the end of a shaft 88 on which the pickup roller 68 is concentrically mounted. The shaft 88 of the pickup roller 68 is, in turn, journaled at each end to the brackets 64 through a releasable semicircular collar 90 attached by bolts 92 to the bracket. Herein, the axle of the terminal idler gear, designated 83', also serves as the shaft 72 for pivotally mounting the support bracket 64 to the side frame 62 so that when the bracket is rotated about the shaft, the terminal idler gear remains engaged with the drive gear 86 of the pickup roller 68.

In this instance, as can best be seen in FIG. 4, the pickup roller 68 has a peripheral surface portion 68P which projects radially into the reservoir 66 containing the supply of coating material or ink. A pair of upper and lower inclined doctor blades 94 and 96 attached to the doctor blade head 98 on shoulders 98A, 98B engage the roller surface to doctor the excess liquid coating material or ink picked up from the reservoir by the engraved surface 70 of the roller. The reservoir cavity 66 herein is formed within an elongated doctor blade head 98 having a generally C-shaped cross-section with an opening 100 extending longitudinally along one side facing the pickup roller 68. The reservoir 66 is supplied with liquid material or ink from a supply drum 102 disposed in a remote location within or near the press 12. Preferably, the doctor blade head 98 is removably attached to the brackets 64, herein by bolts 104 having enlarged, knurled heads 106, and which can be threaded through slots 108 formed in the brackets to clamp the reservoir in place on the brackets.

To insure that an adequate supply of liquid coating material is always present within the reservoir 66 and to prevent coagulation and clogging of the doctor blades 94 and 96 by the liquid coating material or ink, the coating material or ink is circulated through the reservoir by two pumps 110 and 112 as shown in FIG. 5. Pump 110 draws the liquid material L from the supply drum 102 via a supply line 114 and discharges it into a bottom region of the reservoir 66 through a delivery port 114P, and the other pump 112 acts to provide suction to a pair of return lines 116A, 116B coupled adjacent a top region of the reservoir through return ports 116P, 116Q for withdrawing excess liquid coating material or ink from the reservoir. By supplying the coating material or ink from the supply drum 102 at a greater rate than the rate of withdrawal of material by the pickup roller 68, a substantially constant supply of coating material or ink will always be present within the reservoir 66. The excess coating material or ink which rises above the liquid level of the return port R (FIG. 8) is suctioned away by the suction return pump 112.

The general arrangement of the pickup roller 68, doctor blades 94 and 96, and reservoir 66 is similar to that disclosed in U.S. Pat. No. 4,821,672 entitled "Doctor Blade Assembly With Rotary End Seals and Interchangeable Heads", the disclosure of which provides details concerning the end seal structure and operation of a pickup roller and reservoir usable with the present invention. According to an important feature of the present invention, however, the doctor blade reservoir 66 is not pressurized as taught by the prior art. Instead, coating liquid or ink is supplied to the doctor blade reservoir 66 by the suction flow produced by the pump 112. In this arrangement, the suction pump 112 applies a vacuum or suction force in the reservoir which draws liquid material L from the supply through the supply conduit 114 to the reservoir and draws excess liquid material L from the doctor blade reservoir 66 through the return conduit 116 into the remote reservoir 102 at a rate which is greater than the rate that liquid coating material or ink is being supplied to the doctor blade reservoir through the supply conduit 114. Because the suction return flow rate is greater than the supply flow rate, a positive pressure condition within the doctor blade reservoir is avoided, and a below atmospheric vacuum pressure level is provided.

Referring to FIG. 5, FIG. 6, FIG. 7 and FIG. 8, the liquid material is delivered into the lower region of the doctor blade reservoir 66, and is withdrawn from the doctor blade reservoir near an upper region of the chamber through the return conduits 116A, 116B. The liquid level elevation of the return port is preferably selected to provide for the accumulation of liquid coating material or ink in more than about half of the doctor blade chamber, thereby insuring that the engraved surface of the pickup roller 68 will be thoroughly wetted by the coating material or ink L as it turns through the doctor blade chamber 66. The reservoir 66 is bounded

vertically by lower and upper doctor head shoulders 98A, 98B. Accordingly, the return ports 116P, 116Q of return lines 116A, 116B are located at a liquid level R intermediate the limits established by the lower and upper shoulders. Any excess liquid coating material or ink which rises above the liquid level R of the return ports will be suctioned away by the pump 112.

It will be appreciated that the supply pump 110 is optional, and that the suction circulation system can be operated effectively with only the single suction pump 112 as shown in FIG. 6. In the single pump configuration, it may be necessary to prime the supply conduit 114 to obtain satisfactory operation. The two pump arrangement as shown in FIG. 5 is preferred for those installations in which the supply drum 102 is located at a distance that is too far from the press to achieve adequate suction flow. The auxiliary supply pump 110 provides positive flow input to the doctor blade reservoir at a fixed flow rate. The return suction pump 112 has a faster suction flow rate than the supply flow rate. Consequently, a positive pressure buildup in the doctor blade reservoir cannot occur. By utilizing two pumps as shown in FIG. 5, the liquid level within the doctor blade chamber 66 can be closely controlled, without positive pressure buildup, thereby reducing leakage through the end seals.

Referring to FIG. 8, it will be appreciated that the doctor blade chamber 66 is maintained at a pressure level below atmospheric by the suction action of the return flow pump 112. The coating liquid L rises to the liquid level of the return port R and is drawn off immediately by the suction pump 112. Additionally, air within the doctor blade chamber 66 is also evacuated, thereby reducing the doctor blade chamber pressure to a level below atmospheric. This negative pressure differential condition opposes leakage of coating liquid L through the end seals. Since the doctor blade chamber 66 is not positively pressurized, the end seals are operated under favorable pressure differential conditions, thereby extending their useful lifetime. Moreover, the negative pressure differential doctor blade assembly will accommodate a pickup roller having a chipped corner, which would leak under positive pressure conditions, but does not leak because of the negative pressure reservoir condition established by suction flow.

It is useful for the press operator to have an advance warning of an impending end seal failure. With advance warning, the press operator can schedule repair and/or replacement of the doctor blades and the end seals at a convenient time, for example between press runs or before undertaking the next printing job. Apparatus for monitoring the suction/vacuum condition within the doctor blade chamber 66 is provided by a pneumatic sensor circuit 120 as shown in FIG. 9. The pneumatic sensor circuit 120 includes a pneumatic sensor line 122 which is coupled in fluid communication with the doctor blade chamber 66 through a vacuum sensor bore 124 formed through the upper doctor head shoulder 98B. The vacuum sensor line 122 is coupled to the sensor bore 124 by a threaded fitting 126.

Continuous monitoring of the vacuum/suction condition within the doctor blade chamber 66 is provided by a vacuum gauge 128 which can be of any conventional design, for example a Bourdon gauge which is calibrated for dry air and covers the range from about zero to about twenty torrs. The vacuum gauge 128 is coupled into the sensor line 122 by a tee coupling 130. According to this arrangement, the press operator receives a continuous visual indication of the vacuum/-suction condition within the doctor blade chamber 66.

According to another feature of the invention, the vacuum/suction line 122 is coupled to a vacuum switch 132. The vacuum switch 132 has a conductive, movable diaphragm 134 which moves into and out of electrical contact with switch electrodes 132A, 132B. That is, the diaphragm 134 is pulled out of contacting engagement with the switch electrodes 132A, 132B when the vacuum/suction level in the doctor blade chamber 66 is below a predetermined level. When the pressure level within the doctor blade chamber 66 rises above that preset level, for example in response to leakage of air through the end seals or around a worn doctor blade 94, the vacuum force within the vacuum chamber 132C of the sensor switch also rises, thereby permitting the conductive switch element 134 to engage the switch electrodes 132A, 132B.

When switch closure occurs, electrical power is applied to an audio transducer 136 from a power source 138. Electrical current is conducted through the pneumatic switch 132 to the audio transducer 136 through power conductors 140, 142. According to this arrangement, the press operator will receive an audible alert as soon as the suction/vacuum pressure in the doctor blade chamber rises above a safe operating level, thereby signaling wear failure of the doctor blades and-/or an impending failure of the end seals.

From the foregoing, it should be apparent that the coating apparatus 10 of the present invention provides a highly reliable, effective and economical in-line apparatus for applying coating material to the freshly printed sheets 18 in a sheet-fed, offset rotary printing press 12 which allows the final printing station to continue to be used as a print station, yet which does not require any substantial press modification or the addition of a separate timed applicator roller. While a particular form of the present invention has been illustrated and described, it should be apparent that variations and modifications therein can be made without departing from the spirit and scope of the invention.

What is claimed is:

1. Coating apparatus for applying liquid material from a supply drum to an applicator roller which is engagable in an operative position with a doctor blade head having an elongated reservoir for receiving liquid material from the supply drum, said doctor blade head being adapted to extend in parallel with the applicator roller in the operative position with a portion of the peripheral surface of the applicator roller extending into said reservoir for wetting contact with liquid material contained therein, characterized in that:

seal means are coupled to the doctor blade head for sealing engagement against the applicator roller in the operative position, whereby the doctor reservoir is sealed with respect to atmospheric pressure; and,

circulation means are coupled to the doctor reservoir for inducing the flow of liquid material from said supply drum into the doctor reservoir, for returning liquid material by suction flow from the doctor reservoir to the supply drum, and for maintaining the doctor reservoir at a pressure level below atmospheric pressure.

2. Coating apparatus as defined in claim 1, said circulation means being characterized by

a supply conduit connecting the supply drum in flow communication with the doctor reservoir;

a return conduit connecting the doctor reservoir in flow communication with the supply drum; and,

a first pump coupled in series flow relation with the return conduit for inducing suction flow of liquid material from the doctor reservoir through the return conduit into the supply drum.

3. Coating apparatus as defined in claim 2, characterized in that the return conduit is coupled in flow communication with the doctor reservoir at a first liquid level location and the supply conduit is coupled in flow communication with the doctor reservoir at a second liquid level location, the first liquid level location of the return conduit being higher in elevation than the second liquid level location of the supply conduit when the doctor blade head is in the operative position.

4. Coating apparatus as defined in claim 1, said circulation means being characterized by:

a second pump coupled in series flow relation with said supply conduit for pumping liquid material from the supply drum to the doctor reservoir.

5. Coating apparatus as defined in claim 4, characterized in that the suction return flow rate provided by said first pump is greater than the supply flow rate provided by said second pump.

6. Coating apparatus as defined in claim 1, wherein the doctor blade head having first and second shoulders forming lower and upper liquid level boundaries for said reservoir, respectively, characterized in that said circulation means includes a return conduit coupled in flow communication with said reservoir at a liquid level location disposed intermediate the liquid level boundaries established by said first and second shoulders.

7. Coating apparatus as defined in claim 1, characterized in that a pneumatic conduit is coupled to the doctor reservoir for sensing air vacuum pressure within the doctor reservoir, and a vacuum gauge is coupled to the pneumatic conduit for providing a visual indication of air vacuum pressure in the doctor reservoir.

8. Coating apparatus as defined in claim 1, characterized in that a pneumatic conduit is coupled to the doctor reservoir for sensing air vacuum pressure within the doctor reservoir, a vacuum responsive switch having switch electrodes is coupled to said pneumatic sensor conduit, and an audio transducer is electrically connected to the switch electrodes for making and breaking an electrical circuit from a power source to said audio transducer.

9. Coating apparatus as defined in claim 1, characterized in that means are coupled to the doctor reservoir for supplying and evacuating liquid material to and from the doctor reservoir at differential flow rates, respectively, whereby a lower chamber region of the doctor reservoir is maintained in a filled condition and an upper chamber region of the reservoir is maintained in an evacuated condition.

10. Coating apparatus for applying liquid material from a supply drum to an applicator roller which is engagable in an operative position with a doctor blade head having an elongated reservoir for receiving liquid material from the supply drum, said doctor blade head being adapted to extend in parallel with the applicator roller in the operative position with a portion of the peripheral surface of the applicator roller extending into said reservoir for wetting contact with liquid material contained therein, and including doctor blade means attached to the doctor blade head for engagement against the peripheral surface of the applicator roller in the operative position, characterized in that:

circulation means are coupled to the doctor reservoir for inducing the flow of liquid material from said supply drum into the doctor reservoir and for returning liquid material by suction flow from the doctor reservoir to the supply drum; and

means are provided for mounting the coating apparatus on the side frame of a printing press adjacent to a transfer delivery cylinder, a liquid material coating blanket is secured to the transfer delivery cylinder, and including means for extending the applicator roller into engagement with the coating blanket in the operative position and for retracting the applicator roller out of engagement with the coating blanket in an idle position.

* * * * *

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United States Patent [19]

Switall

[11] **Patent Number: 4,617,865**

[45] **Date of Patent: Oct. 21, 1986**

[54] **LIQUID COATER FOR A PRINTING PRESS WITH MOVEABLE INKING ROLLER AND TRAY**

[75] Inventor: **Thomas G. Switall**, Wheeling, Ill.

[73] Assignee: **Ryco Graphic Manufacturing, Inc.**, Wheeling, Ill.

[21] Appl. No.: **763,274**

[22] Filed: **Aug. 7, 1985**

[51] **Int. Cl.**[4] **B41F 31/00**

[52] **U.S. Cl.** **101/350**; 101/367

[58] **Field of Search** ..... 101/348–352, 101/375, 364, 247, 367, 207–210, DIG. 10, 148, 137, 139–140, 143–145, 182–185

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Primary Examiner—E. H. Eickholt
Attorney, Agent, or Firm—Lee, Smith & Zickert

[57] **ABSTRACT**

The coating apparatus disclosed in this application is for a printing press having a recessed printing cylinder. The mechanism comprises a frame, a tray mounted on the frame for holding a supply of the coating material and roller means carried by the frame for transferring the liquid coating material from the tray to the printing cylinder. A pair of track members extend upwardly and rearwardly from the press and the frame is mounted on these tracks for movement toward and away from the printing press cylinder. Means is provided for moving the frame between its remote position and its position adjacent the printing press cylinder. The roller means and the tray are preferably mounted on a subframe which is pivotally mounted on the frame and means is provided for pivoting the subframe so that the roller means will move into position for engagement with the printing press cylinder after the frame has been moved into its position adjacent the cylinder. Means is also provided for positively locking the frame in its position adjacent the cylinder.

17 Claims, 9 Drawing Figures

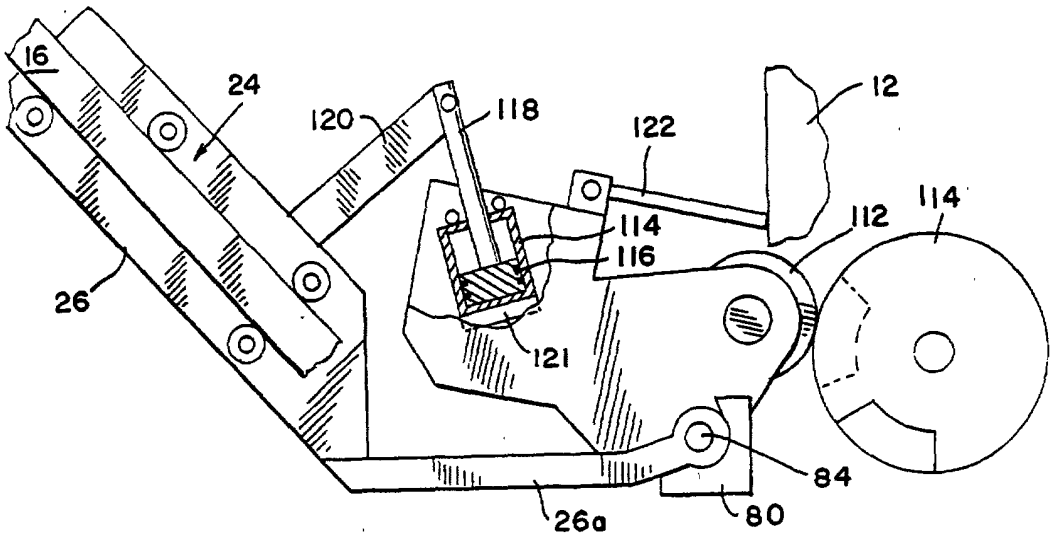

FIG. 4

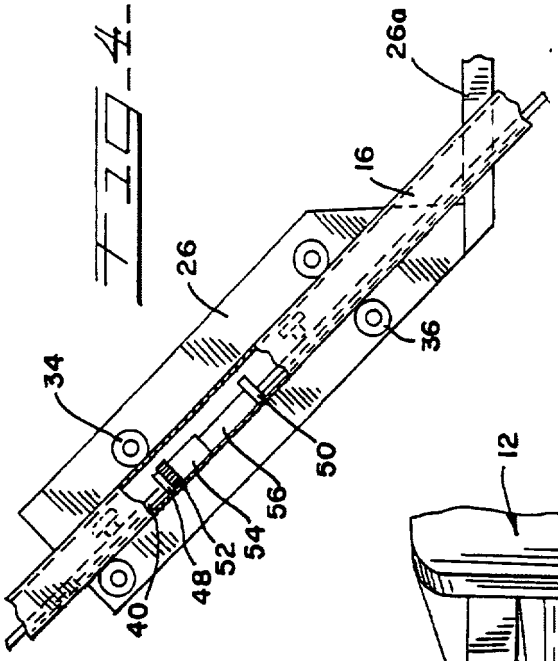
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FIG. 1

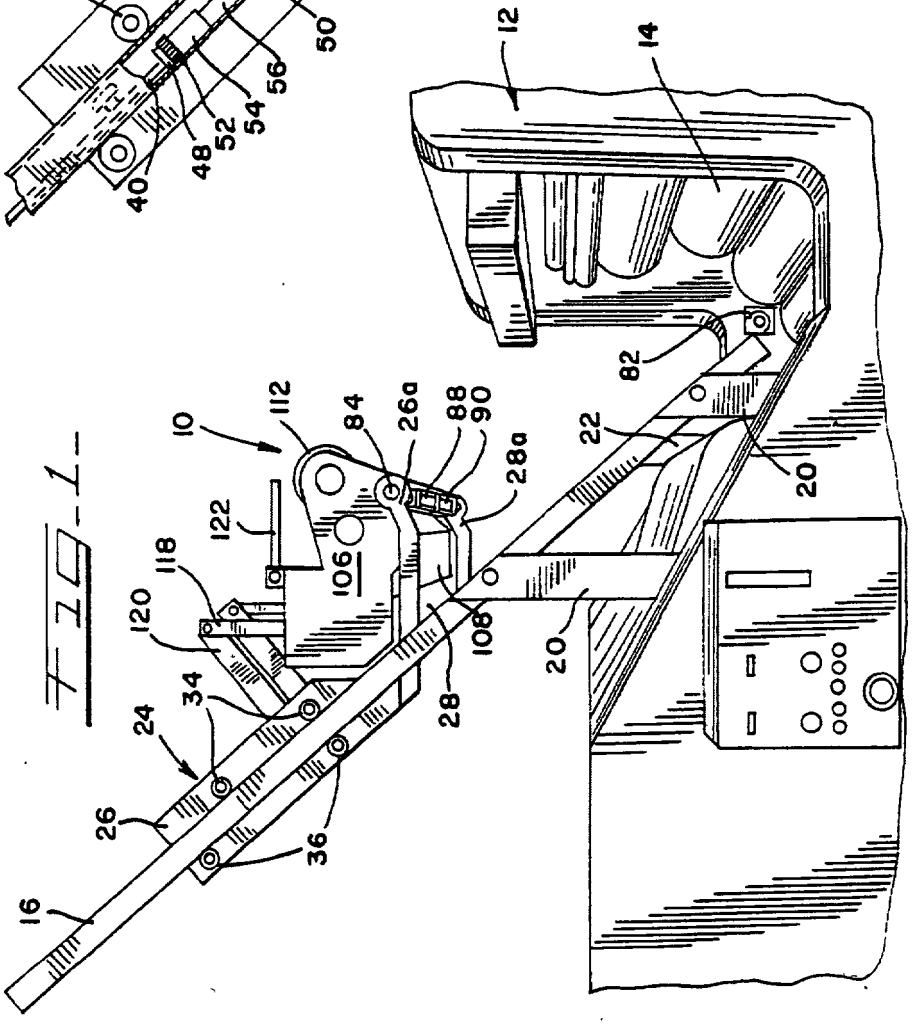
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FIG. 2

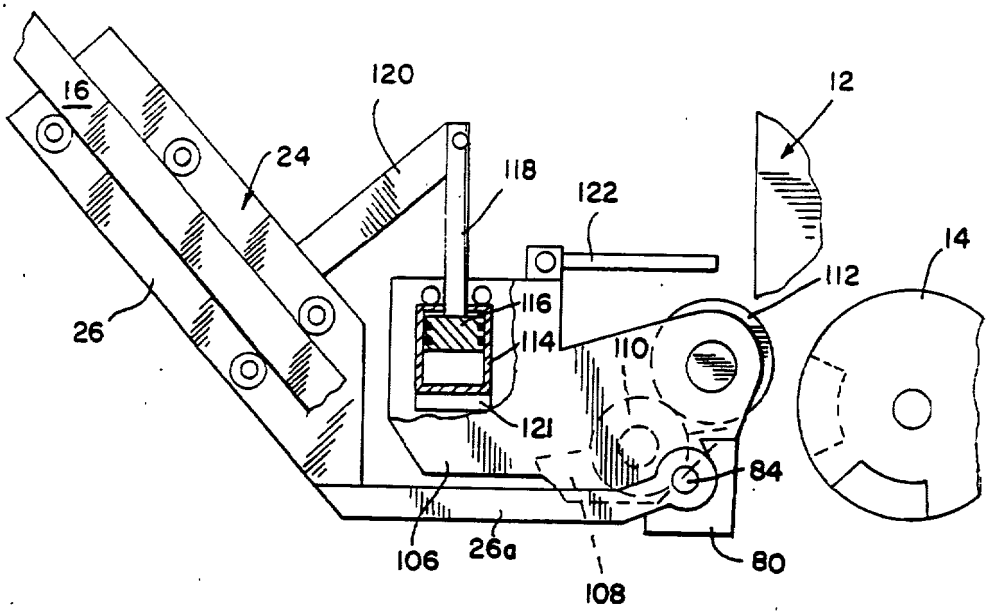
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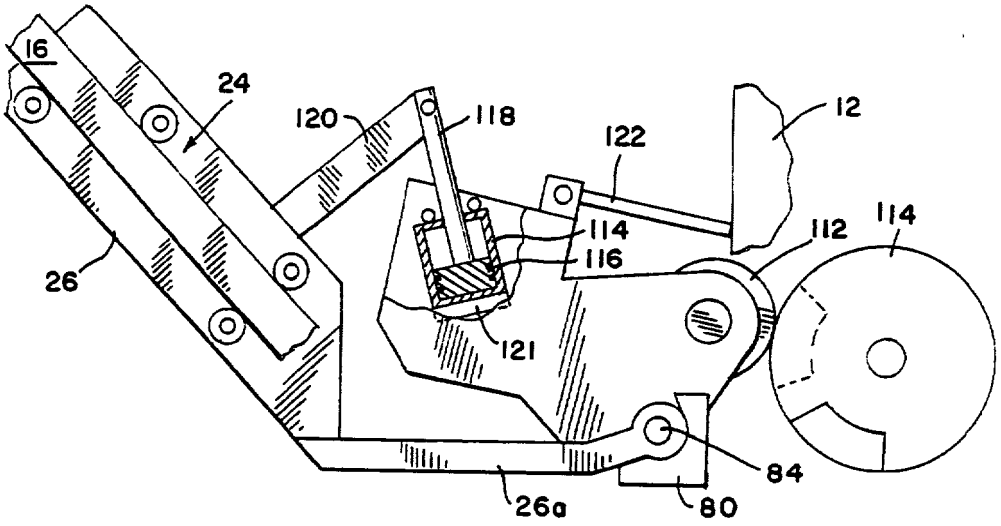
FIG. 3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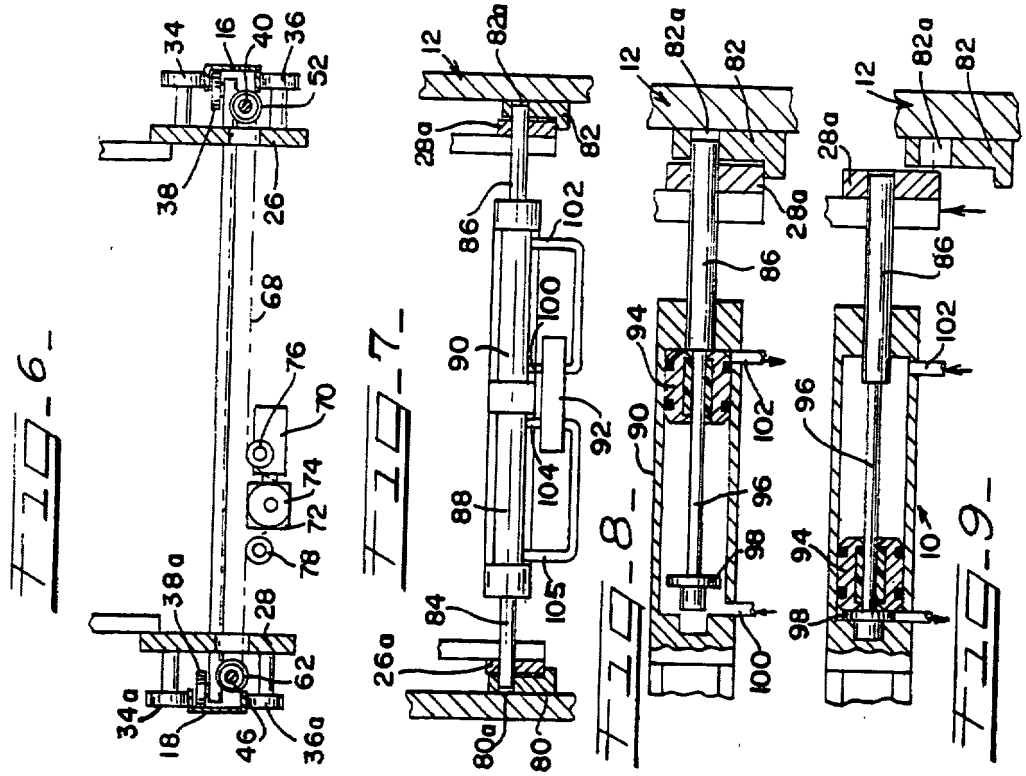

FIG-6

FIG-7

FIG-8

FIG-9

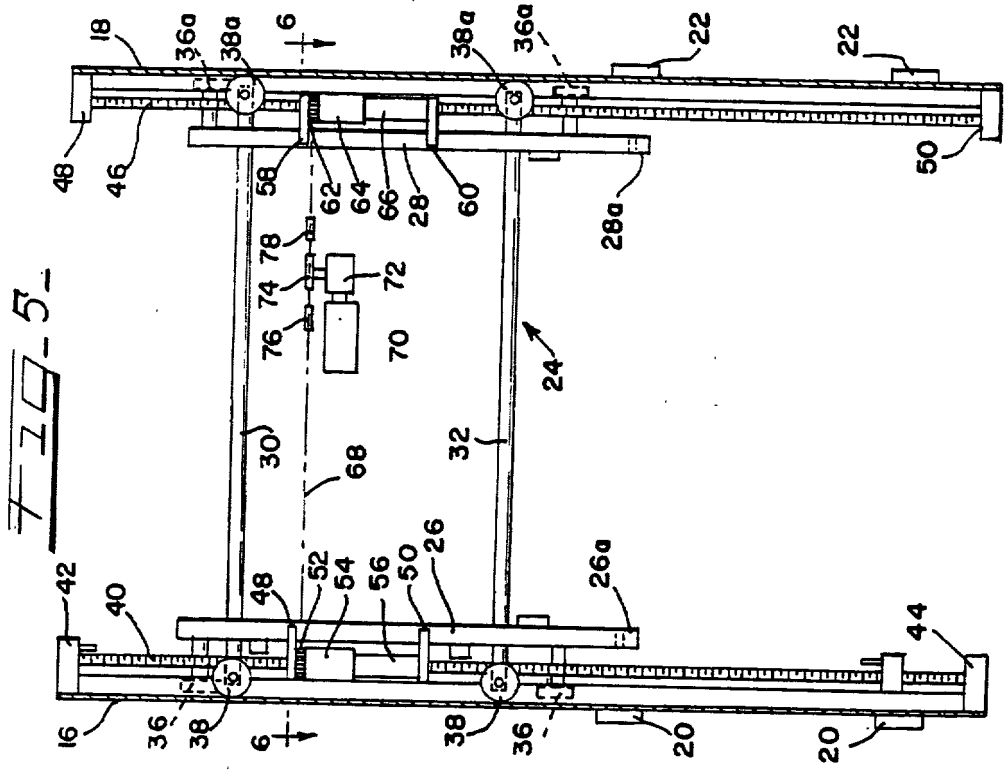

FIG-5

LIQUID COATER FOR A PRINTING PRESS WITH MOVEABLE INKING ROLLER AND TRAY

BACKGROUND AND SUMMARY OF THE INVENTION

This invention relates to a liquid coater for supplying a liquid coating material to a printing press cylinder for transfer to the paper web or sheet being printed. The mechanism has particular application to a printing press having a recessed cylinder. The mechanism permits the coating rollers and tray holding the coating material to be selectively moved into and out of position for coating. When the coating rollers and tray are moved out of position they will not interfere with the printing operation or otherwise be in the way of the press operator.

It has become common practice to utilize a coater for applying a liquid coating material to the blanket of a web offset printing press so that the printed sheet or web which is moving through the press can be coated. The coating material is usually an aquaeous coating which when dry renders the printed paper resistent to moisture and oils and prevents smearing. The coaters for applying this material generally utilize a tray for holding the liquid coating material and a feed roller rotating in the liquid coating material in the tray. A coater roller is in rotating engagement with the feed roller and also in rotating engagement with the blanket cylinder of the printing press. The coating material is picked up from the tray by the feed roller, transferred to the coater roller, and retransferred to the blanket by the coater roller.

Since the coater is an adjunct to the printing press, the main function of the press being to print, the coater must be capable of being moved into and out of position with respect to the blanket cylinder. The coater may be rotrofitted onto existing presses, or it may be worked into existing press designs. In most presses, the coater can be easily added and is not in the way of the printing operation of the press. However, in a number of printing presses, the blanket cylinder is recessed so that there is very little room for the coater to be moved into position for coating the blanket cylinder. Heretofore, it has not been possible to utilize a coater with such presses because the coater would be in the way of the press operator and interfere with the normal printing operation of the press. Thus, with presses such as the "Heidelberg Speed Master", a separate coater was heretofore required.

The present invention obviates the need for a separate coater and permits the coater to be mounted on presses which have a recessed blanket cylinder. In accordance with this invention, the coater may be moved into and out of position so that it does not interfere with the printing operation of the press and it permits the printed material to be coated as it is being moved through the printing press, thus, not only saving equipment, but saving time and labor by eliminating a separate operation on a separate piece of equipment.

In accordance with one aspect of the invention, the coater mechanism for applying a liquid coating material to the recessed printing press cylinder comprises a frame, a tray mounted on the frame for holding a supply of the coating material and roller means carried by the frame for transferring the coating material from the tray to the printing press cylinder. Track means is attached to the printing press and extends from adjacent the printing press cylinder to a point remote from the printing press cylinder. The tray and roller means are preferably mounted on a subframe attached and carried by the coater frame and the coater frame in turn in mounted on the track means. Means is provided for moving the frame and the subframe with the tray and roller means carried thereon, along the track means into and out of position adjacent the printing press cylinder, and means is provided for moving the roller means into and out of position for engagement with the printing press cylinder after the coater frame has been moved to its position adjacent the cylinder. It is preferred that there be a means for locking the coater frame in its position adjacent the cylinder when it has been moved into that position. Once the frame has been moved into its position adjacent the printing press cylinder, and the subframe has been moved to position the roller means into contact engagement with the printing press cylinder, the liquid coating material may be picked up from the tray by the roller means and applied to the printing press cylinder.

In the preferred embodiment, the track means comprises a pair of rectilinear tracks which extend upwardly and rearwardly and roller means on the frame rollably engage the track means so that the frame may be moved relative to the track means toward and away from the printing press cylinder.

The frame may be moved along the track means by means of a pair of internally threaded nut members mounted for rotation adjacent opposite sides of the coater frame. Extending through the nut members and mounted in fixed position relative to the track means are a pair of spaced parallel, externally threaded rods. The drive means includes means interconnecting the nut members and for rotating them in unison selectively in a direction which will move the frame toward the press cylinder and in the opposite direction away from the press cylinder.

The subframe is preferrably pivotally mounted on the front arms of the frame so that when the frame has been moved to its lower-most position adjacent the press cylinder, the subframe may be pivoted or tilted forwardly to bring the roller means into contact with the printing press cylinder so that the coating material may be applied to the printing press cylinder.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a coater constructed in accordance with this invention showing the coater moved out of its coating position, i.e. away from engagement with the blanket cylinder of the web offset printing press.

FIG. 2 is an enlarged side elevation view of portions of the press and coater schematically showing the coater after it has been moved to its coating position adjacent the printing press cylinder.

FIG. 3 is an enlarged side elevation view of the same portions of the press and coater showing the pivotal or tilting movement of the subframe to cause the coater roller to engage the surface of the printing press cylinder for the transfer of liquid coating material thereto.

FIG. 4 is a side elevation view of a portions of the coater frame and track means, with part of the track means cut away to show part of the drive means for moving the frame of the coater along the track means toward and away from the printing press cylinder.

FIG. 5 is a top plan view of portions of the frame and track means with the subframe removed, showing the

drive means for moving the frame along the track means.

FIG. 6 is a sectional end elevational view taken substantially the lines 6—6 of FIG. 5.

FIG. 7 is a sectional view taken across the front arms of the frame and showing the means for locking the frame into its lower-most position adjacent the press cylinder.

FIG. 8 is an enlarged end elevational view of a portion of the locking mechanism showing the mechanism in its locking position.

FIG. 9 is a view similar to FIG. 8 showing the locking mechanism after it has been moved to its unlocked position and after the frame has been moved away from its position adjacent the press cylinder.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The coater **10** constructed in accordance with this invention is illustrated in FIG. **1** where it is used on a web offset press **12**. The press has a blanket cylinder **14** which is normally used in the offset printing operation of the press. However, printing presses of this type have a number of different printing stages, usually one for each color, and where one of the stages or printing roller sets is not being used for printing, it has been found convenient to utilize the blanket cylinder of that otherwise unused stage of the printing press as a means for applying a coating to the web or sheet as it moving through the press. The coating material is usually an aquaeous coating which provides moisture and oil resistant matte or glossy finish to the paper and protects it from smearing.

The particular press **12** illustrated in FIG. **1** has very little room within which to apply the coating material and heretofore it has been impossible to use a coater in such a press where the blanket cylinder was recessed and other portions of the printing press prevented the coater from being moved rearwardly away from its coating position so that the blanket cylinder could be used for a printing operation as well as a coating operation.

In order to move the coater **10** into and out of position for applying the coating material to the blanket cylinder **14**, a track means in the form of two channel-shaped tracks **16** and **18** are connected to the frame of the press **12** by means of supports **20** and **22**, respectively (see FIG. **5**). The tracks **16** and **18** extend upwardly and rearwardly at an angle of approximately 45 to 50 degrees from the horizontal. Mounted between the tracks **16** and **18** is a carriage frame **24** consisting of a pair of parallel side plates **26** and **28** and a pair of transverse bars **30** and **32** which extend between the side plates thus forming a substantially rectangular frame. The side plates **26** and **28** have arms **26***a* and **28***a* which extend forwardly and outwardly at approximately a supplementary angle with the angle of the tracks **16** and **18** so that these arms will be generally horizontal in their orientation at all times and in all positions of movement of the carriage frame **24** relative to the tracks.

The carriage frame **24** is mounted on the tracks for movement between a remote position as illustrated in FIG. **1** and a position where the coater is adjacent the blanket cylinder **14** of the printing press, schematically illustrated in FIGS. **2** and **3**. For this purpose, on each of the side plates **26** and **28** there are two pairs of rollers. Roller pair **34** adjacent the top of the side plate **26** roll along the top flange of the channel-shaped track **16** and roller pair **36** located adjacent the bottom of the side plate **26** roll along the bottom flange of the track **16**. This is illustrated in FIG. **1**. Similar pairs of rollers **34***a* and **36***a* extend outwardly from the side plate **28** to rollably engage the top and bottom flanges, respectively, of the channel-shaped track **18**. This is shown in FIGS. **5** and **6**. As may also be seen in those figures, rollers **38** and **38***a*, rotating on vertical axes, engage the inside vertical surfaces of the tracks **16** and **18**, respectively. Thus, the coater carriage frame **24** is able to move up and down the angular tracks **16** and **18** on the rollers **34**, **36** and **38** and **34***a*, **36***a* and **38***a*, respectively.

Means is also provided for forcibly moving the carriage frame along the tracks and this is through a synchronized screw-thread drive. An externally threaded rod **40** is mounted between end mounts **42** and **44** at each end of the track **16**. This rod which is a ball screw is mounted in fixed position and extends parallel to the track **16**. Similarly, a ball screw **46** extends between end mounts **48** and **50** at the ends of the track **18** and this ball screw is also mounted in fixed position and extends parallel to the track **18**. Extending outwardly from side plate **26** of the carriage frame are a pair of support brackets **48** and **50**, and journalled for rotation between these brackets is a sprocket **52**, a connector **54** and a ball nut **56**. The sprocket, connector and ball nut surround the ball screw **40**, and the internally threaded ball nut **56** is in threaded engagement with the threads of the ball screw **40**. Similarly, on the opposite side of the carraige frame, a pair of spaced brackets **58** and **60** extend outwardly from side plate **28**. Journalled for rotation between these brackets is a sprocket **62**, a connector **64** and a ball nut **66**, all of which surround the ball screw **46**. The connectors **54** and **64** connect the sprockets **52** and **62** to their respective ball nuts **56** and **66**. The sprockets **52** and **62** are operatively connected together and driven in unison by means of a sprocket chain **68**. The sprocket chain in turn is driven by means of a motor **70** operating through a reduction gear box **72** and a drive sprocket **74**. On either side of the drive sprocket **74** are idler sprockets **76** and **78**.

Thus, the carriage frame **24** may be rolled along the tracks **16** and **18** through operation of the motor **70** which may be driven in the forward or reverse directions to drive the sprocket chain **68** and the sprockets **52** and **62**. These sprockets, which are connected to the ball nuts **56** and **66**, respectively, will rotate these ball nuts relative to the ball screws **40** and **46**, respectively, causing the ball nut **56** to move up or down on the ball screw **40** and the ball nut **66** to move or down on the ball screw **46**, thereby driving the carriage frame **24** upwardly or downwardly, depending upon the direction of operation of the motor **70**.

While the ball nuts **56** and **66** may be any kind of internally threaded member to mate with the externally threaded rods **40** and **46** respectively, it is preferred that these be ball nuts and rods. The ball nuts have ball bearings arranged in an internally threaded fashion and the external threads of the ball screw **40** are adapted to mate with the ball bearings thus providing a very low friction type of connection between threse two internally and externally threaded members.

The frame **24** is adapted to be moved between an elevated and rearwardly disposed position substantially as illustrated in FIG. **1** to a lowered and forwardly disposed coating position as shown schematically in FIG. **2**. In this lowered position, the rounded forward end of the arm **26***a* will seat in a positioning block **80**

mounted on one side of the press frame, and the corresponding arm 28*a* of side plate 28 will seat within a correspondingly positioning block 82 mounted on the opposite side of the press frame (see FIGS. 1, 2 and 7).

Means is provided for locking the carriage frame in its lowered position adjacent the blanket cylinder of the press. This mechanism is illustrated in FIGS. 7-9. The positioning blocks 80 and 82 mounted on opposite sides of the frame of the press 12 have holes 80*a* and 82*a*, respectively, which serve as keepers for the locking pins 84 and 86. As shown in FIG. 7, when the side plate arms 26*a* and 28*a* of the carriage frame have been moved into position in seating engagement with the positioning blocks 80 and 82 respectively, the locking pins 84 and 86 will align with the respective holes 80*a* and 82*a* on the positioning blocks. In FIG. 7, the locking pins are in position within the keeper holes 80*a* and 82*b*, thus locking the carriage frame arms 26*a* and 28*a* in their lowermost position.

In order to effect locking and unlocking movements of the locking pins 84 and 86, a pair of air cylinders 88 and 90 are provided and these are controlled by means of an air valve 92. As may be seen in FIGS. 8 and 9, each of the air cylinders 88 and 90 has a moveable piston 94 which has a lost motion connection with the shank 96 of the locking pin, and at the end of the shank there is an enlarged head portion 98. The shank 96 is of substantially smaller diameter than the diameters of either the head portion 98 or the locking pins 84 and 86, and there are air ports 100 and 102 for cylinder 90 and corresponding air ports 104 and 106 for the air cylinder 88.

When the air valve 92 permits air under pressure to enter air port 100 and to exit air port 102 of the cylinder 90, the piston 94 within that cylinder will be driven to the right as illustrated in FIG. 8 and impact against the locking pin 86 to drive the pin to the right into the keeper hole 82*a* of the positioning block 82. When it is desired to unlock the arms of the carriage frame, the air valve 92 is reversed, causing air to enter air port 102 and exit air port 100. This will drive the piston 94 to the left as illustrated in FIGS. 8 and 9 to the position illustrated in FIG. 9 where it impacts the large head 98 and drives that head together with the shank 96 and the locking pin 86 to the left, thereby withdrawing the pin 86 from the keeper hole 82*a*.

The operation of the air cylinder 88 is identical and simultaneous when the air valve 92 permits air to enter air port 100 it also permits air to enter air port 104 of cylinder 88 so that both pistons of the air cylinders are driven outwardly to drive the pins 84 and 86 into their respective keepers 80*a* and 82*a* to lock the arms of the carriage frame in position. When the air valve 92 is reversed and air is permitted to enter air port 102 of the cylinder 90, it also enters air port 105 of the cylinder 88 to drive the respective pistons 94 inwardly toward one another extracting the locking pins 84 and 86 from their respective keepers thereby unlocking the arms 26*a* and 28*a* of the carriage frame.

Pivotally mounted on the locking pins 84 and 86 is a subframe 106 on which is carried a tray 108, a feed roller 110 and the coater roller 112. The liquid coating material is contained in the tray 108 and is picked up by the feed roller 110 and applied to the coater roller 112 in the usual and well known manner. The coater roller is then adapted to contact the blanket cylinder 14 to apply the coating material to the blanket cylinder.

It is important to note that the locking pins 84 and 86 form the pivotal axis of the subframe 106 and when these pins enter their respective keeper holes 80*a* and 82*a*, the pivotal axis of the subframe and of the coater roller 112 will be accurately determined and will be firmly anchored in place relative to the press 12, preventing movement of this pivotal axis during the coating operation.

When the coater frame has been moved to its lowermost position adjacent the blanket cylinder 14, and the arms 26*a* and 28*a* have been locked in their position. As previously described, the coater roller 112 will be positioned in spaced relationship with the blanket cylinder 14. In order to bring the coater roller into contact with the blanket cylinder 14, the subframe 106 is pivoted about the now firmly anchored locking pins 84 and 86 from the position illustrated in FIG. 2 to the position illustrated in FIG. 3. This pivoting or tilting movement of the subframe may be accomplished by means of an air cylinder 114 pivotally mounted on the subframe and having a moveable piston 116. An operating rod 118 is pivotally connected to a rigid upstanding arm 120 mounted on the carriage 24. The air cylinder is operated by an air valve 121 similar to valve 92, previously described in connection with the locking mechanism. When the piston 116 is moved to is elevated position illustrated in FIG. 2, the subframe is in its normal horizontal position with the coater roller 112 out of contact with the blanket cylinder 14. When the piston 116 is moved to its lower position by the controlling air valve 121, the subframe 106 will be pulled upwardly and tilted about the axis of the locking pins 84 and 86 to the position illustrated in FIG. 3 placing the coater roller in contact with the surface of the blanket cylinder 14. So that this position may be accurately determined, it is preferred that there be a rigid arm 122 which extends forwardly to engage the frame of the press 12 when the subframe 106 has been tilted to its position as illustrated in FIG. 3. In the illustrated embodiment, the air piston 114 is pivotally mounted on the subframe 106 so that when the subframe is tilted or pivoted about is axis, the air cylinder 114 may also be tilted about its axis.

The foregoing preferred embodiment has been described only by way of example and it will be appreciated that there are many modifications which can be made without departing from the spirit and scope of the invention as hereinafter claimed. For example, various other track arrangements can be employed for moving the carriage 24 up and down, and the means for forcibly moving the carriage along the tracks may also be varied. If desired, the rods 40 and 46 could be rendered moveable with the ball nuts 56 and 66 stationary. In this manner, the motor for rotating the rod 40 and 46 could be located on the track. However, this is not preferred. Various other and well known locking mechanisms could be used to lock the frame in its lowered position adjacent the blanket cylinder and various means other than that disclosed can be used to tilt the subframe into contact with the blanket cylinder.

The coater described herein solves the problem of how to provide a coater for the blanket cylinder where that blanket cylinder is recessed and where the rearward movement of the coater away from the blanket cylinder would be normally prohibited.

What is claimed is:

1. In a printing press having a recessed printing press cylinder, a coater for applying a liquid coating material to the printing press cylinder, said coater comprising a

frame, a tray mounted on said frame for holding a supply of coating material, roller means carried by said frame for transferring coating material from said tray to the printing press cylinder, track means attached to the printing press and extending from adjacent said printing press cylinder to a point remote from said printing press cylinder, frame moving means for moving said frame and said tray and roller means carried thereby along a first path defined by said track means into and out of position adjacent said printing press cylinder, and tray and roller moving means for moving said roller means along a second path which differs from and intersects said first path into and out of position for engagement with the printing press cylinder after said frame has been moved to its position adjacent said cylinder, whereby liquid coating material may be picked up from said tray and applied to said printing press cylinder by said roller means.

2. The structure of claim 1 wherein said track means comprising a pair of spaced parallel rectilinear tracks.

3. The structure of claim 2 wherein said tracks extend upwardly and rearwardly from adjacent said printing press cylinder.

4. The structure of claim 2 and further including frame locking means for locking said frame in position adjacent said printing press cylinder while permitting said tray and roller moving means to move said roller means transversely into and out of position for engagement with said printing press cylinder.

5. The structure of claim 1 wherein track-engaging roller means is provided on said frame for engaging said track means whereby said frame may be rollaby moved along said track means.

6. The structure of claim 1 wherein said frame moving means comprises

first threaded means on said frame,

second threaded means on said track means in threaded engagement with said first threaded means,

drive means for rotating one of said threaded means relative to the other, whereby said frame may be selectively moved along said track means toward and away from adjacent said printing press cylinder.

7. The structure of claim 6 wherein said first threaded means comprises at least one internally threaded nut member, and said second threaded means comprises at least one externally threaded rod member.

8. The structure of claim 7 wherein said nut member is journalled for rotation on said frame, said rod member is mounted in fixed position relative to said track means, and said drive means is operatively connected to said nut member to selectively rotate said nut member relative to said rod member.

9. The structure of claim 8 wherein said nut member is a ball nut.

10. The structure of claim 1 wherein said tray and roller moving means comprises, a subframe pivotally mounted on said frame and carrying said tray and roller means, and subframe moving means for pivotally moving said subframe between a first position wherein said roller means is out of engagement with said printing press cylinder and a second position wherein said roller means is in position for engagement with said cylinder.

11. The structure of claim 10 and further including stop means mounted on said subframe in position for engaging the printing press and stopping the pivotal movement of said subframe when said roller means has reached its position for engagement with said cylinder, whereby the coating position of said roller means may be accurately determined.

12. The structure of claim 10 wherein said subframe moving means comprises an air cylinder mounted on said frame having a moving piston operatively connected to said subframe.

13. The structure of claim 4 wherein said frame locking means comprises latch means carried on said frame, keeper means carried by said printing press and means for forcibly moving said latch means into said keeper means when said frame has been moved into a position adjacent said cylinder.

14. The structure of claim 13 wherein said means for forcibly moving said latch means includes at least one piston having a lost motion connection with said latch means, whereby said latch means may be driven by impact into and out of engagement with said keeper means.

15. The structure of claim 14 wherein said latch means includes a pair of latch pins on opposite sides of said frame, and said fluid actuated piston means comprises a pair of pistons, each having a lost motion connection with a respective one of said latch pins, and means for moving said pistons selectively in opposite directions, whereby said latch pins may be simultaneously driven by impact into and out of engagement with said keeper means.

16. In a printing press having a recessed printing press cylinder, a coater for applying a liquid coating material to the printing press cylnder, said coater comprising a frame, a subframe pivotally mounted on said frame and carrying a tray for holding a supply of coating material and roller means for transferring the coating material from said tray to the printing press cylinder, a pair of spaced tracks attached to the printing press and extending from adjacent said printing press cylinder to a point remote from said printing press cylinder, first drive means for moving said frame along said tracks toward and away from a position adjacent said printing press cylinder, means at the pivotal axis of said subframe for locking said frame in its position adjacent said printing press cylinder, whereby the pivotal axis of said subframe will be accurately fixed relative to the press, and second drive means for pivotally moving said roller means into and out of position for engagement with the printing press cylinder after said frame has been moved to and locked in its position adjacent said cylinder, whereby liquid coating material may be picked up from said tray and applied to said printing press cylinder.

17. In a printing press having a recessed printing press cylinder, a coater for applying a liquid coating material to the printing press cylinder, said coater comprising a frame, a tray mounted on said frame for holding a supply of coating material, roller means carried by said frame for transferring coating material from said tray to the printing press cylinder, track means attached to the printing press and extending from adjacent said printing press cylinder to a point remote from said printing press cylinder, frame moving means for moving said frame and said tray and roller means carried thereby along said track means into and out of position adjacent said printing press cylinder, and tray and roller moving means for moving said roller means into and out of position for engagement with the printing press cylinder after said frame has been moved to its position adjacent said cylinder, whereby liquid coating material may be picked up from said tray and applied to said printing

press cylinder by said roller means, said frame moving means comprising a pair of internally threaded nut members journalled for rotation on opposite sides of said frame, a pair of spaced parallel externally threaded rods mounted in fixed position relative to said track in threaded engagement with said nut members, and drive means operatively interconnecting said nut members for rotating said nut members in unison relative to said rods selectively in one direction to move said frame along said track means toward said printing press and in the opposite direction to move said frame away from said printing press.

* * * * *

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United States Patent [19]

Dirico et al.

[11] **Patent Number: 4,825,804**

[45] **Date of Patent: May 2, 1989**

[54] **VERTICALLY RETRACTING COATER**

[75] Inventors: **Mark A. Dirico**, Quincy, Mass.; **Phillip Rodriguez**, Garland, Tex.

[73] Assignee: **Dahlgren International, Inc.**, Dallas, Tex.

[21] Appl. No.: **42,374**

[22] Filed: **Apr. 24, 1987**

[51] **Int. Cl.**[4] **B05C 11/00**

[52] **U.S. Cl.** **118/46**; 118/262

[58] **Field of Search** 118/46, 262

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Primary Examiner—Shrive Beck
Assistant Examiner—Alain Bashore

[57] **ABSTRACT**

A retractable coater is used on-line with the last unit of a standard offset lithographic printing press. The coater includes a coating assembly mounted on a platform and a retraction guide assembly, the latter comprising:

(i) a horizontal member and means for slidably supporting platform movement along the horizontal member;

(ii) a vertical member slidably guiding vertical movement of the platform and

(iii) means for slidably lifting the platform and coating metering assembly on a course guided by the vertical member.

14 Claims, 4 Drawing Sheets

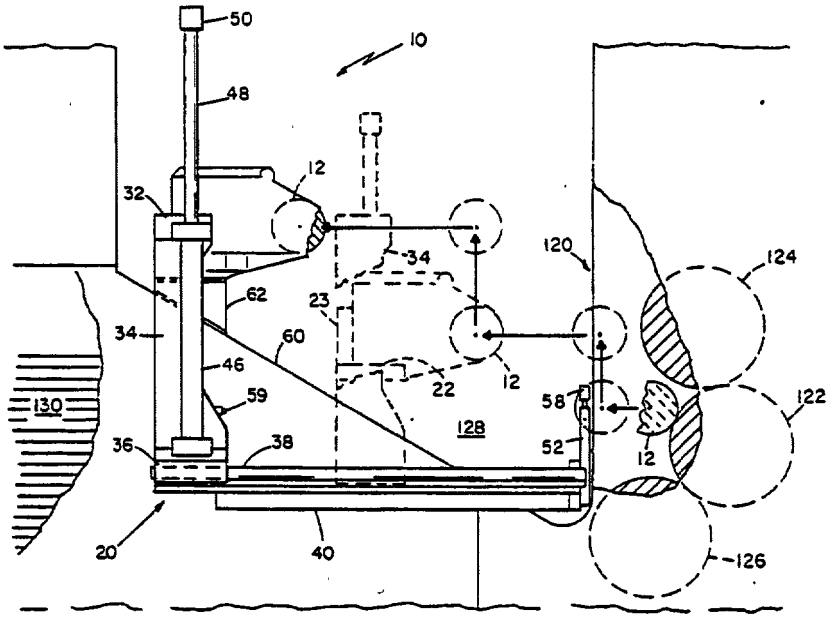
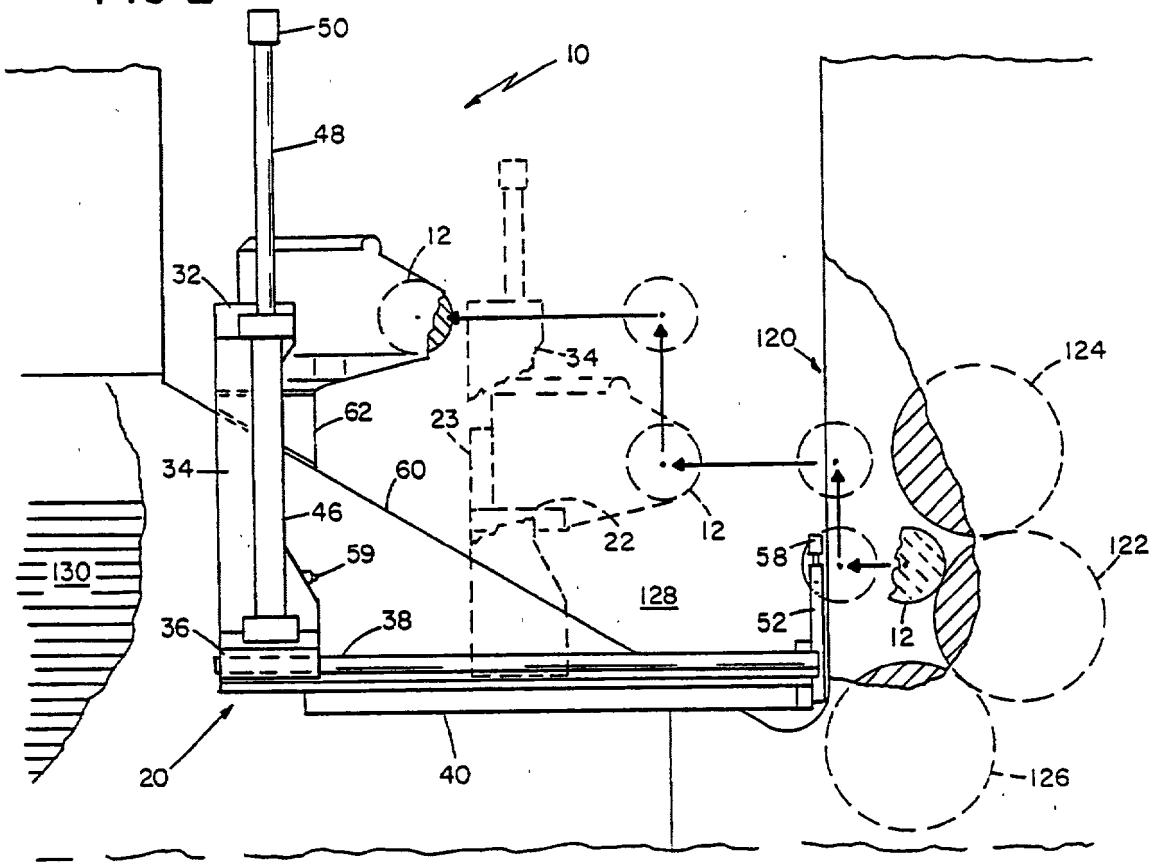


FIG 2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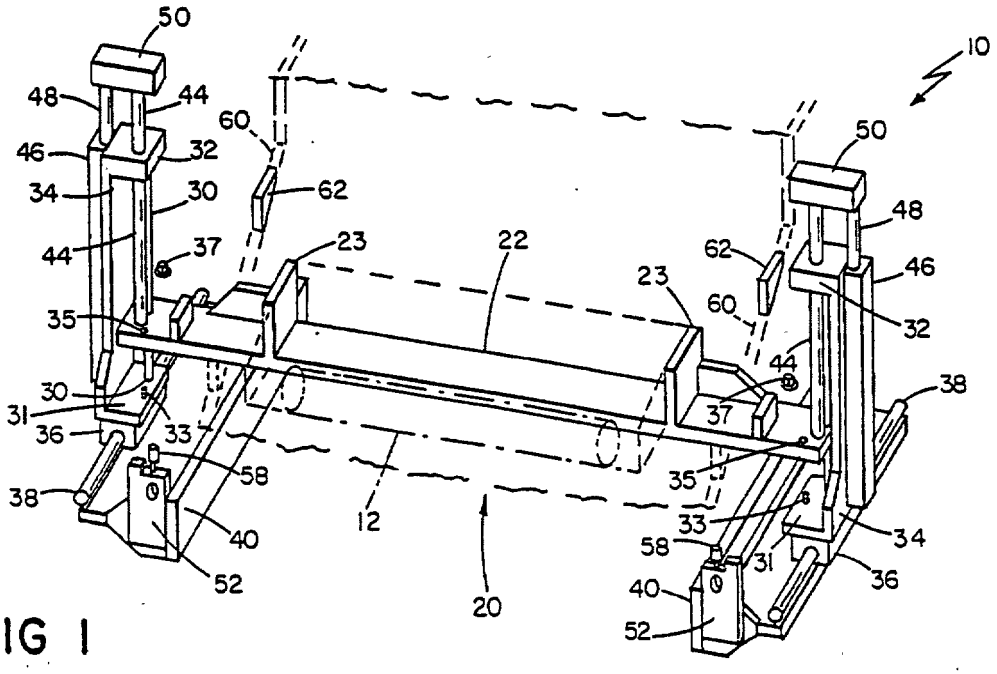
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FIG 1

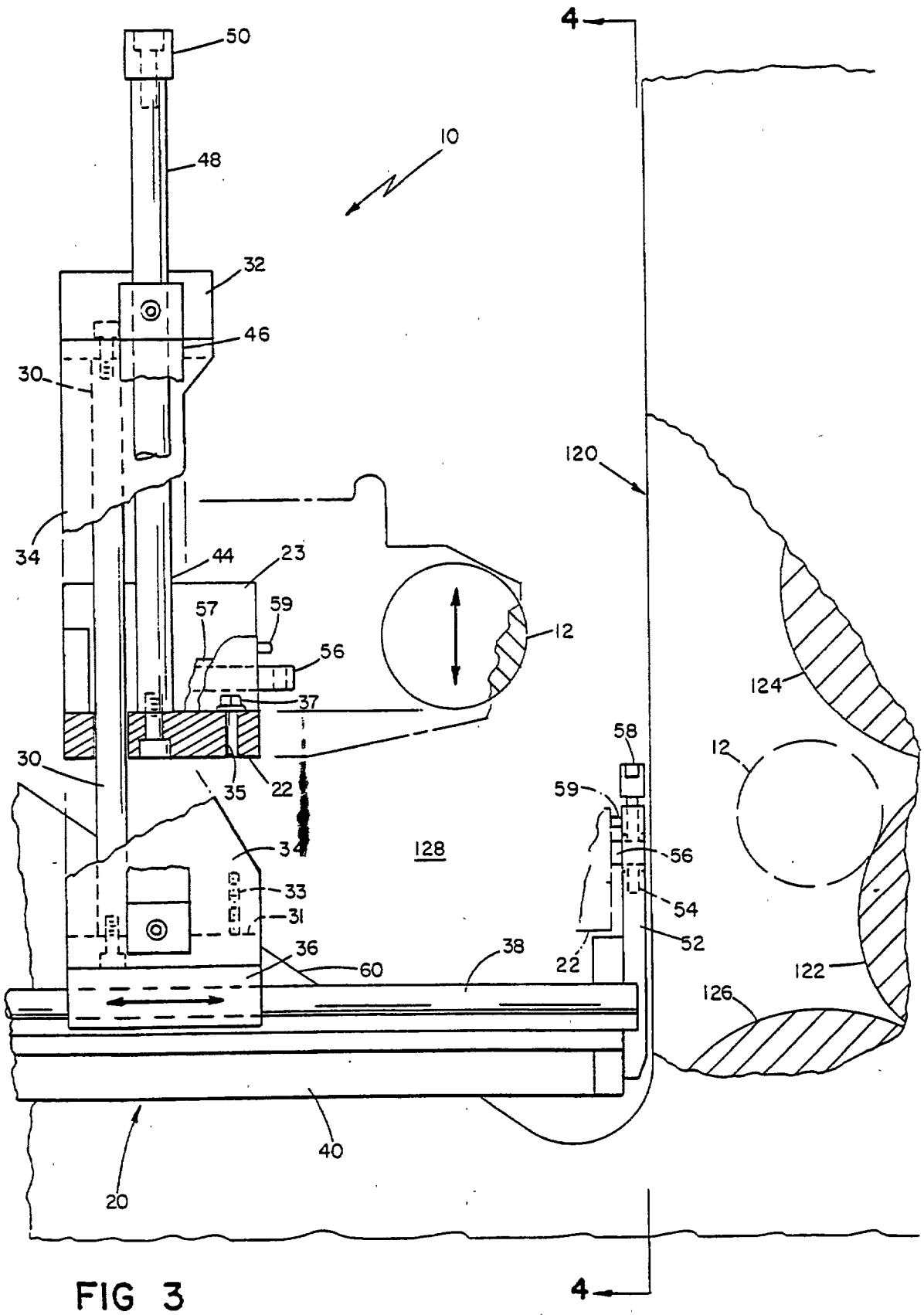
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FIG 3

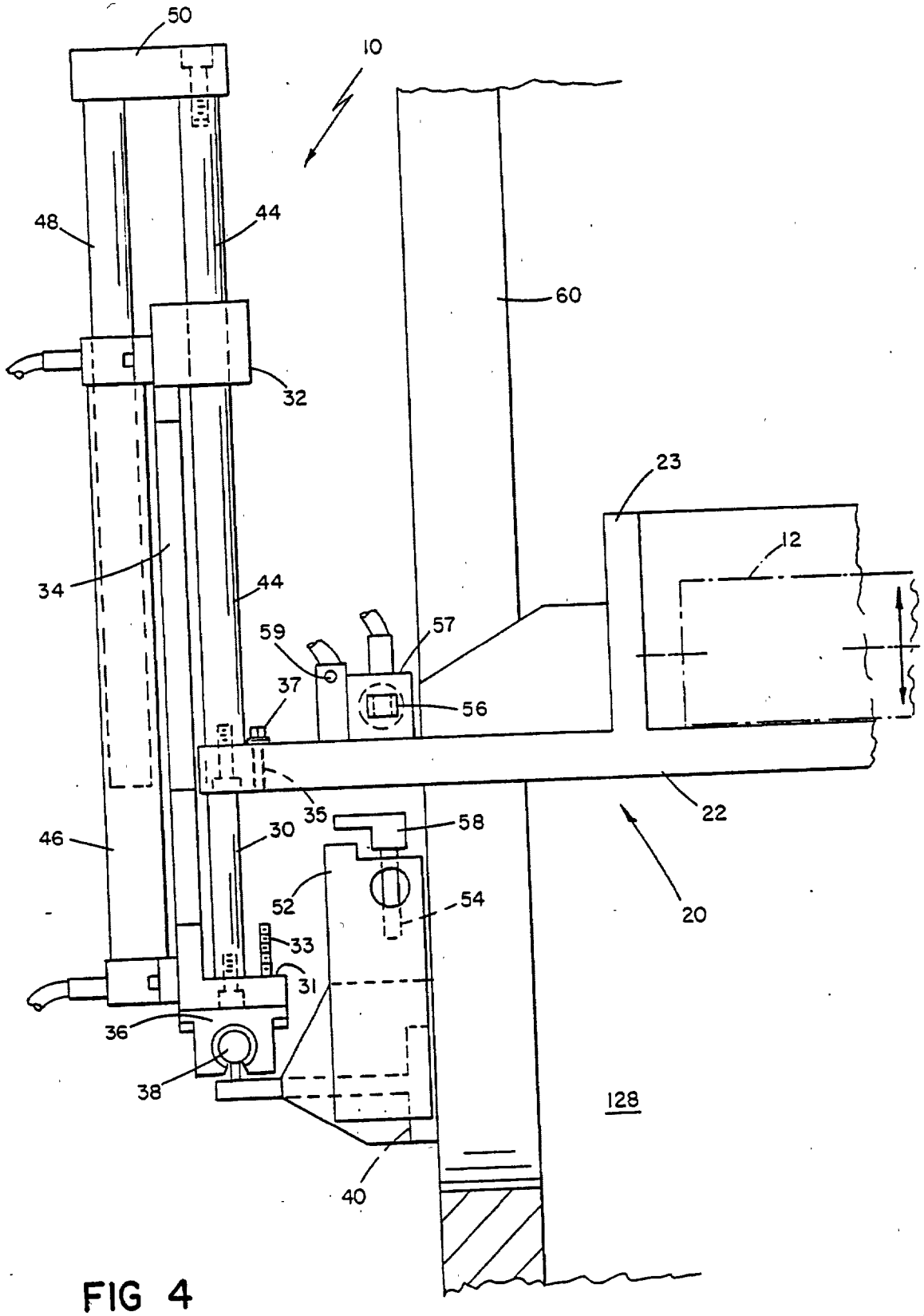
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FIG 4

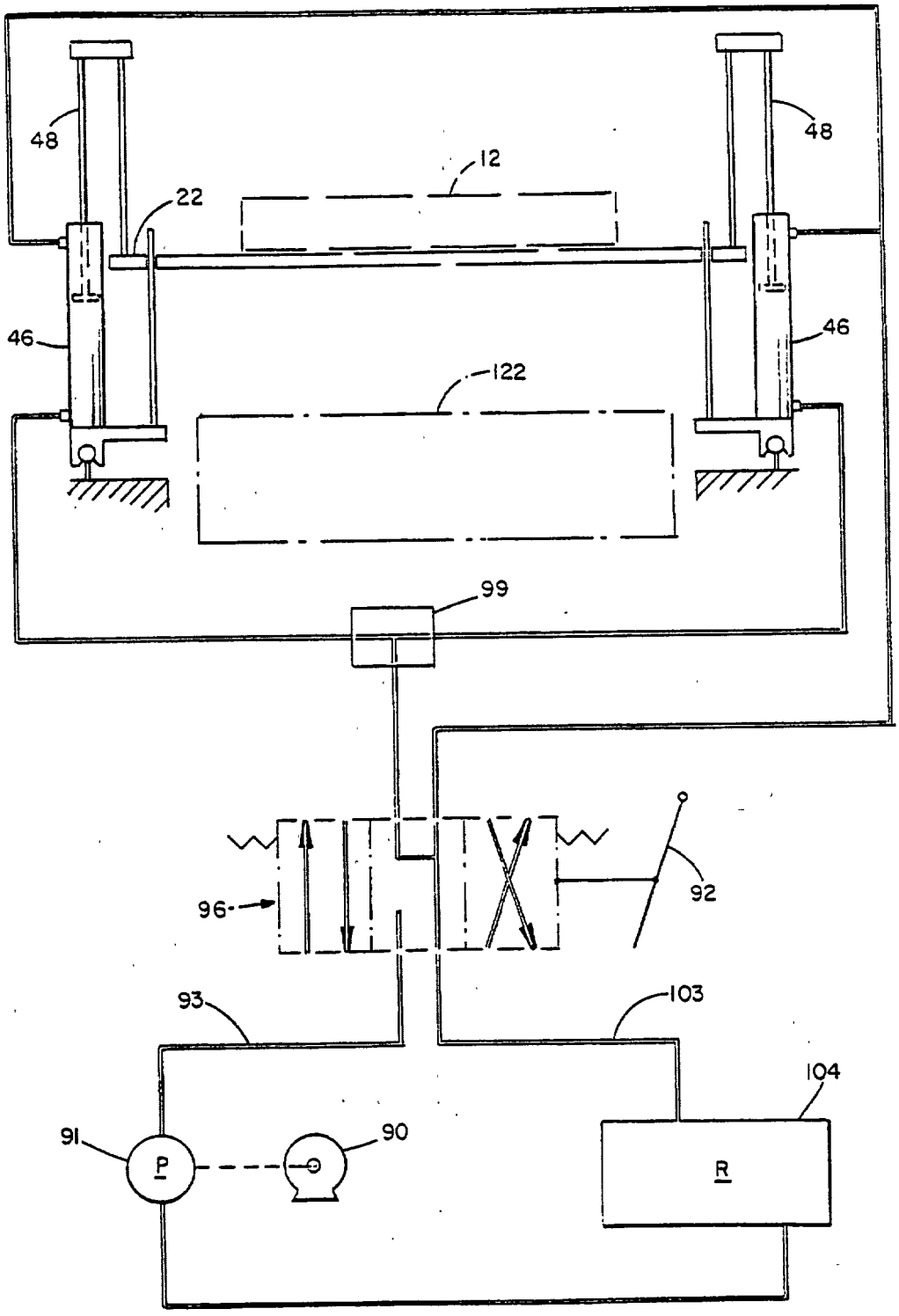

FIG 5

VERTICALLY RETRACTING COATER

BACKGROUND OF THE INVENTION

This invention relates to apparatus for coating a moving web, which is used on-line with a standard off set lithographic printing press unit.

As described in commonly owned, allowed U.S. patent application Ser. No. 719,474, now U.S. Pat. No. 4,685,414, which is hereby incorporated by reference, the final unit of a multi-unit lithographic press can be used to apply coatings. Specifically, a textured roller and coating feed mechanism are fixed to a movable platform, which is locked in place to meter coating to the blanket cylinder of the final press unit. The blanket transfers coating to the workpiece.

As further disclosed in Ser. No. 719,474, when the final unit is needed to print an additional color, the platform, together with the textured roller and the coating feed (including a doctor blade assembly), can be disengaged and moved horizontally away from the final press unit. The dampener and inking mechanisms of the final press unit are then used for off set lithographic printing in the conventional manner.

SUMMARY OF THE INVENTION

The invention generally features a retractable coater for use on-line with the last unit of an off set lithographic printing press. The coater includes a coating assembly mounted on a platform and a retraction guide assembly, the latter comprising:

(i)a horizontal member and means for slidably supporting platform movement along the horizontal member;

(ii) a vertical member slidably guiding vertical movement of the platform and

(iii) means for slidably lifting the platform and coating metering assembly on a course guided by the vertical member.

Preferred embodiments of the invention include the features described below. The horizontal member is a shaft, or like guide member, attached along the outside of the press unit and the platform is adapted to engage a support cooperatively and slidably engaging the shaft. A vertical shaft extends from the platform support (to which the vertical shaft is attached), through an opening in the platform, to a guide block positioned above, and attached to, the support, so that the platform slidably engages the vertical shaft to guide vertical movement of the platform. A lift arm is connected to the platform and to a drive means, e.g. to a force-receiving member that is driven by a force delivering means. Lift is achieved using a pair of hydraulic cylinders, positioned on opposite sides of the platform and connected to hydraulic pressure means through a pressure-compensated flow divider that is adapted to maintain equal flow to each cylinder. In that way, the platform is kept level.

The above-described apparatus improves the ability to use the final press unit for two functions: coating and printing. Specifically, the invention enables the press operator to reliably engage the coating assembly to, and disengage the assembly from, the blanket roll of the final unit, for use as a coater. The invention further enables the operator to disengage the coating assembly and move it away from the final press unit both horizontally and vertically, so that the unit may be used as a conventional lithographic press unit. The vertical lift feature is particularly advantageous because it gives the press operator substantial access to the area between the press delivery, i.e. that region of the press which receives the finished work-product and stacks it for further processing, and the last printing unit. The coating assembly is self-contained and can easily be moved into and out of the operable position with very simple manipulations, yet the assembly is reliably guided and locked for use in a demanding environment.

Other features and advantages of the invention will be apparent from the following description of a preferred embodiment thereof.

DESCRIPTION OF THE PREFERRED EMBODIMENT DRAWINGS

FIG. 1 is a perspective view of a detachable coater, without the adjacent standard lithographic press unit, with parts omitted and parts shown in broken line for clarity.

FIG. 2 is a side view of the detachable coater of FIG. 1, with an alternate position shown in broken lines, with parts broken away and in section.

FIG. 3 is a side view of the detachable coater of FIG. 1, showing the laching mechanism, with parts broken away and in section.

FIG. 4 is a front view of one side of the detachable coater, taken along 4—4 of FIG. 3.

FIG. 5 is a diagram of the hydraulic circuitry of the detachable coater of FIG. 1.

STRUCTURE

In FIGS. 1-4, the detachable coater assembly 10 generally includes the features described in greater detail in U.S. Ser. No. 719,474, referenced above, and there is no need to repeat that description here. The major components of coater assembly 10 are a textured applicator roller 12, a metering doctor blade (not shown), and a coating supply (not shown). The doctor blade and coating supply form a single assembly. Those basic features function generally as described in the '474 application.

This invention generally features the carriage and retraction mechanism for the above-described coater. In FIG. 1, the carriage platform 20 features a base support frame 22 spanning horizontally across press unit. Side frames 23 and 24 extend vertically upward on opposite sides of support frame 22, to support the mounts for the coater assembly. Accordingly, the entire coater assembly is rigidly supported by base frame 22, and retraction movement of frame 22 retracts the coater assembly.

The retraction and lift features on one end of frame 22 are described, with the understanding that the features on the opposite side are identical. Frame 22 is rigidly attached at each end to a vertical lift shaft 44. Shaft 44 extends through an upper bearing block assembly 32. Bearing block assembly 32 is supported by by a vertical support bar 34, connected to a pillow block bearing 36. Pillow block bearing 36 slidably surrounds slide shaft 38 which is supported by bracket 40, which in turn is bolted to the press frame wall 60. It is important to note that bracket 40 extends along the outside of frame wall 60 to support slide shaft 38 in the direction of the press delivery area 130.

Also extending upwardly from block bearing 36 is guide shaft 30, which slidably extends through frame 22 to upper bearing block assembly 32. Hydraulic cylinder

46 is attached to the side of support bar 34 and controls a lift rod 48 which extends to force plate 50 upward, and thereby to lift shaft 44 and frame 22.

As best shown in FIGS. 2-4, press unit 120 includes a blanket cylinder 122, a plate cylinder 124, and an impression cylinder 126. The workpiece is transfered by additional cylinders (not shown) under well 128 to a workpiece delivery area 130, where the work can be delivered and periodically transferred elsewhere.

Each of the two plates 52 on the front of well 128 of press unit 120 has a vertical slot sized and shaped to receive a lock pin 54 (FIG. 3). A horizontal opening to the slot receives the cylinder shaft 56 (FIG. 4) of hydraulic cylinder 57. Pin 54 cooperatively engages a slot in shaft 56 when handle 58 is engaged, to a locking position. Removal of handle 58 and pin 54 releases shaft 56. The locking mechanism allows the coating assembly to be locked into place, with a repeatable, desired resilient tension. An adjustable stop 59 is positioned adjacent cylinder 57. Plate 52 may be mounted to 40 as shown or directly to wall 60 as disclosed in patent '474.

The wall 60 of press unit 120 slants diagonally downward from its highest point at press delivery 130. A support bracket 62 is bolted to wall 60 in position to support the ends of frame 22 when the coating assembly is fully raised and retracted.

FIG. 5 shows the hydraulic power system for the retractor. Electric motor 90 drives pump 91 to drive hydraulic fluid through supply line 93. Supply line 93 supplies directional valve 96, which, under the control of lever 92, determines which half of the hydraulic cylinders 46 receive flow from line 93. Downstream from directional valve 96, flow proceeds through a pilot check valve and a flow-control valve (not shown). Pressure-compensated flow divider 99 ensures that the flow is equal to each of the hydraulic retraction cylinders 46, so that the coater is automatically leveled. The return hydraulic flow is through a flow control valve and pilot check valve (not shown), directional valve 96, return line 103, reservoir 104 and, from there, to pump 91.

Operation

Initially, the coater assembly is in its retracted position, supported by brackets 62. In this position, the assembly is substantially out of the pressman's way, and the press unit is fully useful as an offset lithographic press unit. Specifically, the press unit and press delivery can be fully accessed and used substantially without interference from the coater. The pressman also has substantial access to blanket cylinder 122, as well to the ink and dampener rollers. The pressman also has access to the area underneath well 128, housing transfer rollers.

To convert the press unit to a coater, the coating assembly is guided horizontally along shaft 38 toward the blanket roll to free it from brackets 62. Pressure in hydraulic cylinders 46 is regulated so that lift rods 48 retract into the cylinders, allowing plate 22 to drop; in this way, the coating assembly is aligned (in one or more "steps" as shown in FIG. 2) vertically with the final press unit.

Specifically, vertical alignment is achieved when frame 22 seats on the lower horizontal surface 31 of support bar 34. To provide additional stabilization, threaded studs 33 on either side of surface 31 fit in corresponding openings 35 on frame 22, and flange nuts 37 are threaded on stud 33 to lock frame 22 to bar 34 and thereby stabilize the coater.

Once vertical alignment is achieved, the coating assembly is again advanced horizontally until hydraulic cylinder shaft 56 engages the opening in plate 52. Handle 58 and pin 54 are inserted to lock shaft 56 in place. Resiliently biased cylinder 57 absorbs any excess momentum from the moving coating assembly to prevent damage to the press unit. It also enables a pre-set pressure.

To convert the final unit to a standard printing unit, handles 58 and pin 54 are removed, flange nuts 37 are removed, and the carriage is moved horizontally and vertically to support bracket 62.

OTHER EMBODIMENTS

Other configurations and adaptations of the invention fall within the claims. For example, the lifting hydraulic cylinder can be oriented in the opposite direction, so that lift is achieved when the cylinder arm extends downwardly to press against a fixed support. In this case the body of the cylinder would more vertically with the coater unit while the extended shaft or piston would remain with the support. Multiple guide rods can be used to stabilize movement of the base frame.

We claim:

1. Apparatus for applying a liquid coating to the surface of a sheet work piece, said apparatus being adapted for operation on-line with the last unit of an off set lithographic sheet printing press, said press unit comprising a blanket cylinder and a work-piece delivery area, positioned on the opposite end of a well from said blanket cylinder, said apparatus comprising:

(a) a coating metering assembly supported by a platform comprising,
  (i) a rotably mounted applicator roller,
  (ii) coating delivery means positioned to deliver coating to said applicator roller, and
  (iii) a metering member mounted in position to control the amount of coating on said applicator roller; and

(b) a guide assembly adapted to retract said platform and said coating metering assembly away from said lithographic press unit, said guide assembly comprising
  (i) a horizontal member and means for slidably supporting said platform movement along said horizontal member,
  (ii) a vertical member slidably guiding vertical movement of said platform,
  (iii) means for slidably lifting said platform and coating metering assembly on a course guided by said vertical member,

whereby said coating metering assembly and platform can be moved between a first position in which said applicator roller is locked into position to deliver coating to said blanket cylinder of said lithographic press unit, and a second position horizontally and vertically displaced from said first position a distance allowing substantial access between the last press unit and the work-piece delivery area adjacent said last press unit, when said press unit is operating as an offset lithographic press unit.

2. The apparatus of claim 1 wherein said horizontal member comprises a horizontal guide shaft attached along the outside of the press unit, and said platform is adapted to engage a support cooperatively and slidably engaging said horizontal guide shaft.

3. The apparatus of claim 2 wherein said vertical member comprises a vertical guide shaft attached to said support.

4. The apparatus of claim 3 wherein said vertical guide shaft extends from the support, through an opening in the platform, to a bearing block positioned above and attached to said support, said platform slidably engaging said vertical shaft, whereby vertical movement of said platform is guided by said vertical guide shaft.

5. The apparatus of claim 4 wherein said means for slidably lifting said platform and coating metering assembly comprises a lift shaft connected to said platform, extending through said bearing block and further attached to a force transmitting member.

6. The apparatus of claim 5 wherein said force transmitting member is an extension plate attached to the lift shaft.

7. The apparatus of claim 5 wherein said apparatus further comprises a force-delivering means positioned to deliver force to said force receiving member.

8. The apparatus of claim 1 wherein said means for slidably lifting the platform and coating metering assembly comprises a cylinder driven by pressurized fluid.

9. The apparatus of claim 8 comprising a pair of said cylinders, each member of said pair being positioned on opposite sides of said platform, and

fluid pressure supply means connected through a pressure-compensated flow divider to each member of said pair, said flow divider being adapted to maintain equal flow to each member of said pair.

10. The apparatus of claim 5 comprising: (a) at least two horizontal guide shaft, one of said horizontal guide shafts being on each side of the press unit; (b) at least two vertical guide shafts, one of said vertical guide shafts being on each side of said platform, and (c) at least two lift shafts, one of said lift shafts being connected to each side of said platform.

11. The apparatus of claim 3 further comprising a bracket attached to the press work-piece delivery in position to support said platform in said second position.

12. The apparatus of claim 11 comprising a lock positioned to removably lock said platform in said first position.

13. The apparatus of claim 12 wherein said lock comprises threaded attachment means for locking said platform in said first position.

14. Apparatus for applying a liquid coating to the surface of a sheet workpiece, said apparatus being adapted for operation on-line with the last unit of an off set lithographic sheet printing press, said press unit comprising a blanket cylinder and a work-piece delivery area, positioned on the opposite end of a well from said blanket cylinder, said apparatus comprising:

(a) a coating metering assembly supported by a platform comprising,
  (i) a rotably mounted applicator roller,
  (ii) coating supply means for supplying coating to said applicator roller, and
  (iii) metering means to control the amount of coating on said applicator roller; and
(b) a guide assembly adapted to retract said platform and said coating metering assembly away from said lithographic press unit, said guide assembly comprising,
  (i) a horizontal member and means for slidably supporting said platform movement along said horizontal member,
  (ii) a vertical member slidably guiding vertical movement of said platform,
  (iii) means for slidably lifting said platform and coating metering assembly on a course guided by said vertical member,

whereby said coating metering assembly and platform can be moved between a first position in which said platform is locked into position to deliver coating to said blanket cylinder of said lithographic press unit, sand a second position horizontally and vertically displaced from said first position a distance allowing substantial access between said last press unit and the work-piece delivery area adjacent said last press unit, when said press unit is operating as an offset lithographic press unit.

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(54) High velocity, hot air dryer and extractor.

(57) A hot air dryer (10) utilizes high velocity air jets which scrub and break up the moist air layer which clings to the surface of a freshly printed sheet (S). High velocity air is heated to a high temperature as it flows along a resistance heating element (38) within an air delivery baffle tube (64). The heated, high velocity air pressurizes a plenum chamber (46) within an air distribution manifold (36W). High velocity jets of hot air are discharged through multiple airflow apertures (54) onto the wet ink side of a printed sheet as it moves through a dryer exposure zone (Z). An extractor (40) removes the moist air layer, high velocity hot air and volatiles from the printed sheet (S) and from the press (12).

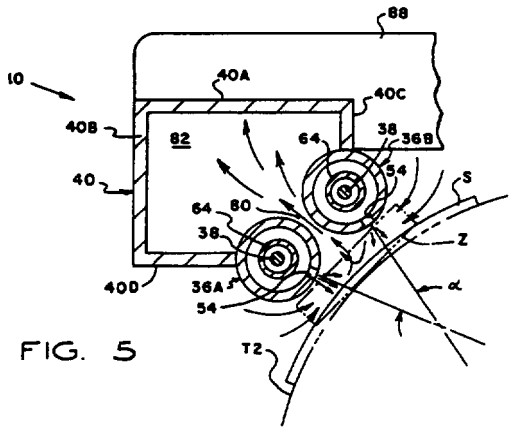

FIG. 5

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This invention relates generally to accessories for sheet-fed, rotary offset and flexographic printing presses, and in particular to a dryer for printed materials which utilizes high velocity, hot air flow and extraction.

In the operation of a rotary offset press, an image is reproduced on a web or sheet of paper or some other printable substrate by a plate cylinder which carries the image, a blanket cylinder which has an ink transfer surface for receiving the inked image, and an impression cylinder which presses the paper against the blanket cylinder so that the inked image is transferred to the paper. In some applications, a protective and/or decorative coating is applied to the surface of the freshly printed sheets. The freshly printed sheets are then transported to a sheet delivery stacker in which the printed sheets are collected and stacked.

The relatively wet condition of the printing ink composition and its solvent and/or diluent components and a layer of moisture laden air which clings to the surface of the freshly printed web or sheet may interfere with the quality of the images as they are printed at each succeeding printing unit. For example, the quality of colored images, half-tone illustrations and the like undergo degradation in the uniformity of their appearance and color because of the presence of the wet ink, volatiles, and moisture within the printed substrate. Moreover, protective coatings will undergo dilution and surface degradation causing a dull finish if the underlying substrate is not dried sufficiently before the coating is applied.

Such defects, including uneven surface appearance of protective/decorative coatings, detract from the appearance of the underlying images or photographs, particularly in the case of multi-colored images or photographs. The defects are caused by residual volatile solvents, diluents, water and the like within the oleoresinous inks of the images, and the presence of moisture in the printed material, at the time that the next successive image is printed or the protective/decorative coating is applied. Because the defects are compounded as the printed material moves through successive printing units, it is desirable that curing and drying be initiated and volatiles and moisture laden air be extracted at each interstation position, as well as at the delivery position.

Hot air dryers and radiant heaters have been used as delivery dryers and as interstation dryers. Interstation dryers employing radiant heat lamps are best suited for slow to moderate press speeds in which the exposure time of each printed sheet to the radiant heat is long enough to initiate ink setting. For high speed press operation, for example, at 5,000 sheets or more per hour, there is not enough available space at the interstation position to install a radiant heater having sufficient number of heat lamps for adequate drying purposes.

As press speed is increased, the exposure time (the length of time that a printed sheet is exposed to the radiant heat) is reduced. Since the number of lamps is limited by the available interstation space, the output power of the radiant lamps has been increased to deliver more radiant energy at higher temperatures to the printed sheets in an effort to compensate for the reduction in exposure time. The increased operating temperatures of the high-powered radiant heat lamps cause significant heat transfer to the associated printing unit and other equipment mounted on the press frame, accelerated wear of bearings and alterations in the viscosities of the ink and coating, as well as upsetting the balance between dampening solution and ink. The heat build-up may also cause operator discomfort and injury.

To handle high speed press operations, an off-press heater has been utilized from which high velocity, heated air is conveyed through a thermally insulated supply duct to a discharge plenum which directs high velocity, heated air onto the printed stock as it moves across the interstation dryer position. Such off-press heaters have proven to be relatively inefficient because of excessive heat loss and pressure drop along the supply duct. Attempts to overcome the heat loss and pressure drop have resulted in substantially increased physical size of the heater equipment (blower fan and supply duct) along with a substantial increase in the electrical power dissipated by the off-press heater.

According to the present invention, a high efficiency hot air dryer utilizes an on-press heater for producing high velocity hot air flow for accelerating the setting of inks on a freshly printed substrate. The on-press heater includes a housing member having a sidewall defining a manifold air distribution or plenum chamber, with the sidewall being intersected by an airflow discharge port. An air delivery tube has an inlet port for receiving high velocity airflow and has a tubular sidewall disposed in the plenum chamber. An elongated heating element is disposed within the inner airflow passage of the air delivery tube. High velocity air is discharged into the air delivery tube in heat transfer contact along the length of the heating element.

Heated, high velocity air is discharged out of the air delivery tube into the plenum chamber of the housing member. Preferably, the high velocity air is supplied to the manifold plenum chamber through an inlet port having an inlet flow area which is greater than the outlet flow area of the hot air discharge port. By this arrangement, heated air will be supplied to the plenum chamber faster than it can be discharged, so that the heated air will be

compressed within the manifold plenum chamber. This assures that jets of hot air which are discharged through multiple outlet apertures are uniform in pressure and velocity along the length of the dryer head, so that the printed sheet is dried uniformly as it is transferred through the exposure zone of the dryer.

According to another aspect of the present invention, the moist air layer is displaced from the surface of the printed sheet by high-velocity hot air jets which scrub and break-up the moisture-laden air layer that adheres to the printed surface of the sheet. The high-velocity hot air jets create turbulence which overcomes the surface tension of the moisture and separates the moisture laden air from the surface of the printed material. The moisture vapor and volatiles become entrained in the forced air flow and are removed from the printing unit by a high volume extractor.

The scrubbing action of the high velocity hot air jets is improved by adjacent rows of multiple discharge apertures which are oriented to deliver a converging pattern of high velocity hot air jets into an exposure zone across the sheet travel path. The high velocity hot air jets are produced by a pair of elongated dryer heads in which high velocity air is heated by heat transfer contact with a resistance heating element within an air delivery baffle tube. Since the release of moisture and other volatiles from the ink and printed material occurs continuously in response to the absorption of thermal energy, the moisture laden air layer is displaced continuously from the printed sheet as the printed sheet travels through the dryer exposure zone in contact with the converging hot air jets.

According to another aspect of the invention, the moisture-laden air, volatiles and hot air completely exhausted from the printing unit by a high volume extractor. An extractor manifold is coupled to a pair of elongated dryer heads and draws the moisture-laden air, volatiles and high velocity hot air from the exposure zone through a longitudinal air gap between the dryer heads. According to this arrangement, the setting of ink on each printed sheet is initiated and accelerated before the sheet is run through the next printing unit.

Operational features and advantages of the present invention will be understood by those skilled in the art upon reading the detailed description which follows with reference to the attached drawings, wherein:

FIGURE 1 is a schematic side elevational view in which multiple dryers of the present invention are installed at interstation positions in a four color offset rotary printing press;

FIGURE 2 is a simplified side elevational view showing the dryer of the present invention installed in an interstation position between two printing units of FIGURE 1;

FIGURE 3 is a bottom plan view showing installation of the dryer assembly of FIGURE 2 in the interstation position;

FIGURE 4 is a perspective view of the interstation dryer shown in FIGURE 2;

FIGURE 5 is a sectional view of the improved dryer of the present invention taken along the line 5-5 of FIGURE 4;

FIGURE 6 is a longitudinal sectional view of the dryer assembly shown in FIGURE 2;

FIGURE 7 is a sectional view of the dryer assembly shown in FIGURE 2, taken along the line 7-7 of FIGURE 6;

FIGURE 8 is a perspective view of a resistance heating element used in the dryer of FIGURE 2;

FIGURE 9 is a perspective view similar to FIGURE 8, with the resistance heating element enclosed in a support sheath;

FIGURE 10 is a view similar to FIGURE 4 which illustrates an alternative embodiment of the dryer head in which the discharge port is formed by an elongated slot; and,

FIGURE 11 is a perspective view, partially broken away, of the dryer head shown in FIGURE 10.

As used herein, the term "processed" refers to various printing processes which may be applied to either side of a sheet, including the application of inks and/or coatings. The term "substrate" refers to sheet material or web material.

Referring now to FIGURE 1, the high velocity hot air dryer 10 of the present invention will be described as used for drying freshly printed substrates, which are successively printed at multiple printing units in a sheet-fed, rotary offset printing press. In the exemplary embodiment, the dryer 10 of the present invention is installed at an interstation position between two printing units of a four color printing press 12 which is capable of handling individual printed sheets having a width of the approximately 40" (102 millimeters) and capable of printing 10,000 sheets per hour or more, such as that manufactured by Heidelberg Druckmaschinen AG of Germany under its designation Heidelberg Speedmaster 102V.

The press 12 includes a press frame 14 coupled on the right end to a sheet feeder 16 from which sheets, herein designated S, are individually and sequentially fed into the press, and at the opposite end, with a sheet stacker 18 in which the printed sheets are collected and stacked. Interposed between the sheet feeder 16 and the sheet stacker 18 are four substantially identical sheet printing units 20A, 20B, 20C and 20D which can print different color inks onto the sheets as they are moved through the press.

As illustrated in FIGURE 1, each sheet fed printing unit is of conventional design, each unit including a plate cylinder 22, a blanket cylinder 24 and an impression cylinder 26. Freshly printed sheets S from the impression cylinder 26 are transferred to the next printing unit by transfer cylinders T1, T2, T3. A protective coating may be applied to the printed sheets by a coating unit 28 which is positioned adjacent to the last printing unit 20D.

The freshly printed and coated sheets S are transported to the sheet stacker 18 by a delivery conveyor system, generally designated 30. The delivery conveyor 30 is of conventional design and includes a pair of endless delivery gripper chains 32 carrying laterally disposed gripper bars having a gripper element for gripping the leading edge of a freshly printed sheet S as it leaves the impression cylinder 26. As the leading edge of the printed sheet S is gripped by the grippers, the delivery chains 32 pull the gripper bar and sheet S away from the impression cylinder 26 and transports the freshly printed and/or coated sheet to the sheet stacker 18.

Prior to delivery, the freshly printed sheets S pass through a delivery dryer 34 which includes a combination of infra-red thermal radiation, forced air flow and extraction.

Referring now to FIGURE 2, FIGURE 5 and FIGURE 6, the interstation dryer 10 includes as its principal components a dryer head 36, a resistance heating element 38, and an extractor head 40. As shown in FIGURE 3, the dryer head 36 is mounted on the press side frame members 14A, 14B by side frame flanges 42, 44. In this interstation position, the dryer head 36 is extended laterally across and radially spaced from the interstation transfer cylinder T2, thereby defining an exposure zone Z.

The dryer head 36 includes a tubular sidewall 36W which encloses an air distribution manifold chamber 46. The air distribution manifold housing is sealed on opposite ends by end plates 48, 50, respectively, and is sealed against the extractor head 40. The manifold housing has an inlet port 52 for admitting high velocity, pressurized air through a supply duct 52 from an off-press compressor 53, and has a discharge port for delivering pressurized hot air into the exposure zone Z.

As shown in FIGURE 6, the air distribution manifold sidewall 36W is intersected by multiple discharge apertures 54 which collectively define the discharge port. The apertures 54 are oriented for discharging pressurized jets of high velocity, hot air toward the interstation transfer cylinder T2, and are longitudinally spaced along the dryer head 36. According to this arrangement, pressurized air jets are directed along a straight line across the printed side of a sheet S as it moves through the dryer exposure zone Z. In an alternative embodiment, as shown in FIGURE 10 and FIGURE 11, the discharge port is formed by an elongated slot 55 which intersects the dryer head sidewall 36W and extends longitudinally along the dryer head.

Referring now to FIGURE 6 and FIGURE 7, the resistance heating element 38 is coupled to the dryer head 36 by and end block 56. The end block 56 has a body portion which is intersected by an axial bore 58, a counterbore 60 and a radial inlet bore 62 which communicates with the counterbore. The heating element 38 has an end portion 38A which projects through the axial bore 58 and counterbore 60, with the elongated body portion of the heating element 38 extending into the plenum chamber 46.

According to an important feature of the present invention, the plenum chamber 46 is partitioned by an elongated air delivery baffle tube 64 which extends substantially the entire length of the dryer head 36. The air delivery baffle tube 64 has an inlet port 66 for receiving high velocity airflow from a remote supply and has a tubular sidewall 64A extending through the plenum chamber. The tubular sidewall 64A has an inner airflow passage 68 which connects the inlet port 66 in airflow communication with the plenum chamber 46 through its open end 64E. The air delivery baffle tube 64 has an end portion 64B projecting through the axial bore 60 of the end block 56, with its inner airflow passage 66 in airflow registration with the radial bore 62.

A pneumatic connector 70 is coupled to the radial inlet bore 62 of the end block 56 for connecting the inner airflow passage 68 to an off-press source of high velocity air. The end block 56 is sealed against the end plate 50, the tubular sheath 78 and against the pneumatic connector 70. High velocity, pressurized air is constrained to flow from the air duct 52 into the airflow passage 68 where it is discharged into the air distribution plenum chamber 46 after absorbing heat from the heating element 38.

As shown in FIGURE 6, the high velocity air flows longitudinally through the annular flow passage 68 in heat transfer contact with the heating element 38. The high velocity air is heated to a high temperature, for example 350 • F (176 • C), before it is discharged through the airflow apertures 54.

To provide uniform air jet discharge through the apertures 54, the inlet area of the inlet port 66 should be greater than the combined outlet area provided by the multiple airflow discharge apertures 54. In the preferred embodiment, the discharge apertures 54 have a diameter of 1/16 inch (0.158 cm), and for a 40" (102 mm) press there are 88 apertures spaced apart along the dryer head 36 on 0.446 inch (1.13 cm) centers. This yields a total

airflow outlet area of 0.269 square inch (1.735 square cm). Preferably, the effective inlet area of the inlet port 66 is at least about 0.54 square inch (3.484 square cm).

In the alternative dryer head embodiment shown in FIGURE 10, the air discharge slot 55 has a length of 40 inches (102 mm) along its longitudinal dimension L, and has an arc length C of 6.725 mils (17×10^{-3} cm).

With the preferred inlet/outlet ratio of about 2:1 or more, the high velocity, heated air will be supplied to the plenum chamber 46 faster than it can be discharged, so that the heated air will be compressed within the manifold plenum chamber. This assures that the jets of hot air which are discharged through the outlet apertures 54 are uniform in pressure and velocity along the length of the dryer head, so that the printed sheet is dried uniformly as it is transferred through the exposure zone Z.

The air distribution baffle tube 64 is supported on the inlet end by the end plate 50, and on its discharge end by flange segments 64F which engage the internal bore of the dryer head 36 and positions the baffle tube in the center of the plenum chamber 46.

Referring now to FIGURE 6, FIGURE 7, FIGURE 8 and FIGURE 9, the heating element 38 is preferably an electrical resistance heater having elongated resistance heater sections 38C, 38D which are integrally formed and folded together about at a common end 38E. The resistance sections 38C, 38D are substantially co-extensive in length with the air delivery baffle tube 64. Each section 38C, 38D is electrically connected to a power conductor 72, 74, respectively, for connecting the resistance heating element 38 to an offpress source of electrical power.

The resistance heater sections 38C, 38D are mechanically stabilized by an end connector 76, and are enclosed within a tubular, thermally conductive sheath 78. Radial expansion of the half sections 38C, 38D is limited by the sidewall of the sheath 78, thus assuring efficient heat transfer, while the sheath provides longitudinal support for the elongated resistance heater sections within the inner airflow passage 68. The heating element halfsections 38C, 38D thus form a continuous loop resistance heating circuit which is energized through the power conductors 72, 74.

The tubular sheath 78 is received within the bore 58 and is welded to the end block 56. The tubular sheath 78 thus provides an opening through the end block 56 to permit insertion and withdrawal of the heating element 38 for replacement purposes. The heating element 38 is dimensioned for a sliding fit within the sheath 78 at ambient temperature. The end cap 76 is releasably secured to the end block 56 by a hold-down metal strap (not illustrated). The distal end 78B of the sheath is sealed by an end cap 78C to prevent leakage of high velocity air out of the distribution manifold chamber 46.

Referring now to FIGURE 2, FIGURE 4, and FIGURE 5, the extractor head 40 is coupled to the back side of a pair of identical dryer heads 36A, 36B. The dryer heads 36A, 36B are separated by a longitudinal air gap 80 which opens in air flow communication with an extractor manifold chamber 82, thereby defining a manifold inlet port. The extractor manifold chamber 82 is enclosed by the end plates 48, 50 and by housing panels 40A, 40B, 40C and 40D. The extractor housing panels 40C, 40D are secured and sealed by a welded union to the dryer heads 36A, 36B.

According to another aspect of the present invention, the multiple air flow apertures 54 of each dryer head 36A, 36B are arranged in linear rows R1, R2, respectively, and extend transversely with respect to the direction of sheet travel as indicate by the arrows S in FIGURE 3. The rows R1, R2 are longitudinally spaced with respect to each other along the sheet travel path. Each air jet expands in a conical pattern as it emerges from the airflow aperture 54. Expanding air jets from adjacent rows intermix within the exposure zone Z, thereby producing turbulent movement of high velocity hot air which scrubs the processed side of the sheet S as it moves through the exposure zone Z. Preferably, balanced air pressure is applied uniformly across the exposure zone Z to ensure that the moist air layer is completely separated and extracted from the freshly printed sheets.

In the exemplary embodiment, the pressure of the high velocity air as it is discharged through the inlet port 66 into the heat transfer passage 68 is about 10 psi (7031 Kgs/m^2). The inlet suction pressure in the longitudinal air gap 80 of the extractor is preferably about 5 inches of water (12.7×10^3 Kgs/cm^3).

As shown in FIGURE 3 and FIGURE 5, the extractor manifold inlet port 80 is coupled in air flow communication with the exposure zone Z for extracting heat, moisture laden air and volatiles out of the dryer. The extractor manifold chamber 82 is coupled in air flow communication with an exhaust fan 84 by an air duct 86. The air duct 86 is coupled to the extractor manifold chamber 82 by a transition duct fitting 88.

The high velocity, heated air which is discharged onto the printed sheet S is also extracted along with the moisture and volatiles through the air gap 80 into the extractor chamber 82. Ambient air, as indicated by the curved arrows, is also suctioned into the exposure zone Z and through the longitudinal air gap, thus assuring that hone of

the hot air, moisture or volatiles will escape into the press area. Extraction from the exposure zone Z is enhanced by directing the hot air jets along converging lines whose intersection defines an acute angle alpha (α), as shown in FIGURE 5.

The air flow capacity of the exhaust fan 84 is preferably about four times the total airflow input to the dryer heads. This will ensure that the exposure zone Z is maintained at a pressure level less than atmospheric thereby preventing the escape of hot air, moisture laden air and volatiles into the press room.

Claims

1. A hot air dryer (10) for installation in a printing press (12), said dryer comprising a dryer head (36) having a housing member (36W) defining an air distribution chamber (46), the housing member having an airflow inlet port (52) for receiving high velocity air and an airflow discharge port (54, 55) for directing heated air onto a substrate (S), and including a heating element (38) disposed in the air distribution chamber, characterized in that:

   an air delivery tube (64) is disposed in the air distribution chamber, the air delivery tube having an elongated airflow passage (68) connecting the inlet port in airflow communication with the air distribution chamber; and

   the heating element (38) is disposed within the elongated airflow passage (68) of the air delivery tube (64).

2. A hot air dryer (10) as defined in claim 1, characterized in that:

   pneumatic connector means (70) are coupled to the air delivery tube (64) for connecting the elongated air flow passage (68) to a source of high velocity air.

3. A hot air dryer (10) as defined in claim 1 or claim 2, characterised in that:

   electrical conductors (72, 74) are coupled to the heating element (38) for connecting the heating element to a source of electrical power.

4. A hot air dryer (10) as defined in any one of claims 1 to 3, characterized in that:

   an end block (56) is coupled to the housing member (36) and to the air delivery tube (64) for sealing the interface between the air delivery tube and the housing member.

5. A hot air dryer (10) as defined in any one of claims 1 to, characterised in that:

   an end block (56) is coupled to the housing member (36), the end block having a body portion intersected by an axial bore (58), a counterbore (60) and a radial inlet bore (62) communicating with the counterbore;

   the heating element (38) having an end portion (38A) projecting through the axial bore and counterbore; and,

   the air delivery tube (64) having an end portion (64B) disposed in the counterbore (60) with its elongated airflow passage (68) being coupled in airflow communication with the radial inlet bore (62).

6. A hot air dryer (10) as defined in any one of the preceding claims, characterized in that:

   the elongated heating element (38) comprises an electrical resistance heater (38C, 38D).

7. A hot air dryer (10) as defined in claim 6, characterized in that:

   the heating element (38) has first and second resistance heater sections (38C,38D), the sections being joined at a common end (38E) and disposed in side-by-side relation.

8. A hot air dryer (10) as defined in any one of the preceding claims, characterized in that:

   a tubular, thermally conductive sheath (78) is disposed within the elongated airflow passage (68); and,

   the heating element (38) is disposed within the sheath.

9. A hot air dryer (10) as defined in any one of the preceding claims, characterized in that:

   an extractor head (40) is coupled to the dryer head (36), the extractor head including a housing member (40A, 40B, 40C, 40D) defining an extractor manifold chamber (82), the extractor head having an elongated inlet port (80) for extracting air from a dryer exposure zone Z into the extractor manifold chamber, and having discharge means (84, 86, 88) coupled to the extractor head for exhausting air from the extractor manifold chamber.

10. A hot air dryer (10) as defined in any one of the preceding claims, characterized in that:

    the airflow discharge port (54) comprises multiple airflow apertures.

11. A hot air dryer (10) as defined in any one of the preceding claims, characterized in that:

    the air discharge port (54) comprises an elongated slot (55).

12. A hot air dryer (10) as defined in any one of the preceding claims, characterized in that:

the dryer head (36) is adapted for installation in an interstation position between adjacent printing press units (20A, 20B, 20C, 20D, 18) of a printing press (12), with the airflow discharge port (54, 55) facing the processed side of a substrate (S) as it is transported along a substrate travel path.

13. A hot air dryer (10) as defined in any one of the preceding claims, characterized in that:

the dryer (10) includes a second dryer head (36B) disposed in side-by-side relation with the first dryer head (36A) in a position facing the freshly processed side of a substrate (S) as it moves through a dryer exposure zone (Z) along a substrate travel path, the second dryer head (36B) having a housing member (36W) defining a second air distribution chamber (46), the housing member of the second dryer head including an inlet port (52) for receiving high velocity air and a discharge port (54, 55) oriented for directing heated air toward the sheet travel path, with the dryer heads being separated from each other by a longitudinal air gap (80); and,

an extractor head (40) is coupled to the dryer heads (36A, 36B), the extractor head including a housing member (40A, 40B, 40C, 40D) defining an extractor manifold chamber (82) and coupled in air flow communication with the longitudinal air gap (80), and having discharge means (84, 86, 88) coupled in air flow communication with the housing member for exhausting air from the extractor manifold chamber (82).

14. A hot air dryer (10) as defined in claim 13, characterized in that:

the discharge ports (54, 55) of the dryer heads are arranged in first and second rows (R1, R2), respectively, the rows being separated from each other along the substrate travel path, wherein heated air discharged from the discharge ports intermix with each other in the dryer exposure zone (Z).

15. A hot air dryer (10) as defined in claim 13 or claim 14, characterised in that:

the discharge ports (54, 55) of the first and second dryer heads are oriented for directing heated air along first and second converging lines (FIGURE 5), respectively.

16. A method for drying a freshly processed substrate (S) in a printing press (12) characterized by the steps:

directing high velocity air through an air delivery tube (64) which is disposed within an air distribution chamber (46);

heating high velocity air flowing through the air delivery tube by heat transfer contact with an elongated heating element (38) disposed within the air delivery tube; and,

discharging heated air from the air distribution chamber onto the freshly processed substrate (S).

17. A method for drying a freshly processed substrate (S) as defined in claim 16, characterized by the step:

compressing the heated air in the air distribution chamber (46) before the heated air is discharged.

18. A method for drying a freshly processed substrate (S) as defined in claim 16 or claim 17, characterised by the steps:

discharging heated air from the air distribution chamber (46) through an outlet port (54, 55); and

supplying the high velocity air to the air distribution chamber (46) through an inlet port (52) having an inlet flow area which is greater than the outlet flow area of the outlet port.

19. A method for drying a freshly processed substrate (S) as defined in any one of claims 16 to 18, characterised by the steps:

discharging jets of heated air from the air distribution chamber (46) through first and second rows (R1, R2) of outlet apertures (54, 55); and

intermixing air jets from the first and second rows in an exposure zone (Z).

20. A method for drying a freshly processed substrate (S) as defined in any one of claims 16 to 18, characterized by the steps:

discharging jets of heated, pressurized air from the air distribution chamber (46) through first and second rows (R1, R2) of outlet apertures; and

directing air jets discharged from air flow apertures of the first and second rows (R1, R2) along first and second converging lines (FIGURE 5), respectively.

21. A method for drying a freshly processed substrate (S) as defined in any one of claims 16 to 20, characterised by the steps:

installing first and second dryer heads (36A, 36B) in side-by-side relation on a printing press (12) in a position facing the processed side of a freshly processed substrate as it

travels through a dryer exposure zone (Z), the dryer heads being separated from each other by a longitudinal air gap (80);

supplying high velocity air to each dryer head (36A, 36B) through first and second air delivery tubes (64) which are disposed within an air distribution chamber (46) in each dryer head, respectively;

heating high velocity air flowing through each air delivery tube (64) by heat transfer contact with an elongated heating element (38) disposed within each air delivery tube;

discharging heated air from each dryer head through the dryer exposure zone (Z) and onto the freshly processed substrate (S); and

extracting air from the exposure zone (Z) through the longitudinal air gap (80).

22. A method for drying a freshly processed substrate (S) as defined in claim 21, characterized by the steps:

discharging heated air from each dryer head (36A, 36B) through an airflow outlet aperture (54, 55); and

supplying high velocity air to each dryer head through an inlet port (52) having an effective inlet flow area which is greater than the combined outlet flow areas of the air flow outlet apertures (54, 55).

23. A method for drying a freshly processed substrate (S) as defined in claim 21, or claim 22, characterised by the steps:

discharging jets of heated air from the first and second dryer heads (36A, 36B) through first and second rows (R1, R2) of outlet apertures (54, 55), respectively; and

intermixing air jets from the first and second rows in the exposure zone (Z).

24. A method for drying a freshly printed substrate (S) as defined in any one of claims 21 to 23, characterized by the steps:

discharging jets of heated air from the first and second dryer heads (36A, 36B) through first and second rows (R1, R2) of outlet apertures (54, 55), respectively; and

directing air jets discharged from air flow apertures of the first and second rows (R1, R2) along first and second converging lines (FIGURE 5), respectively.

25. A method for drying a freshly processed substrate (S) as defined in any one of claims 21 to 24, characterised by the step:

extracting air from the exposure zone (Z) at a volume flow rate through the longitudinal air gap (80) which exceeds the total volume flow rate of air discharged from the first and second dryer heads (36A, 36B).

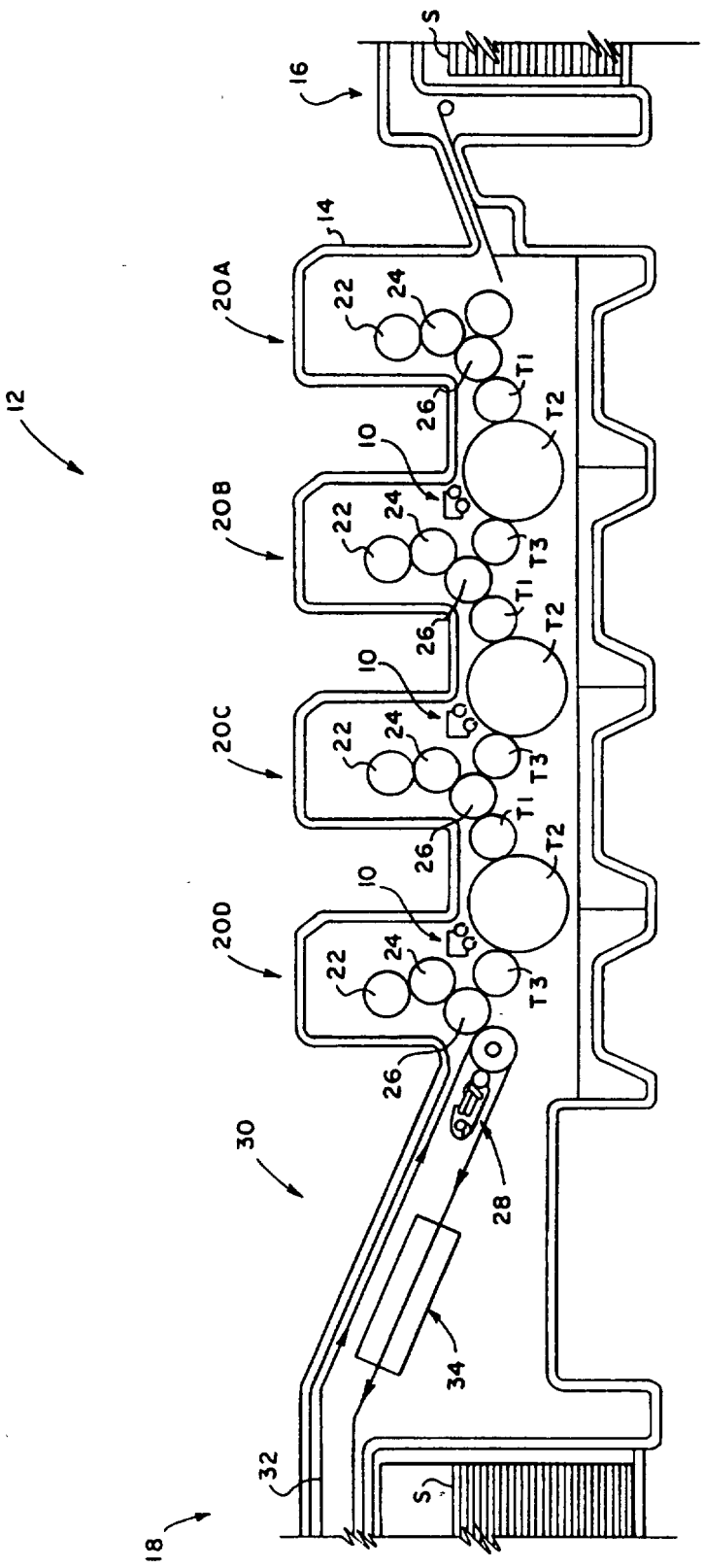


FIG. 1

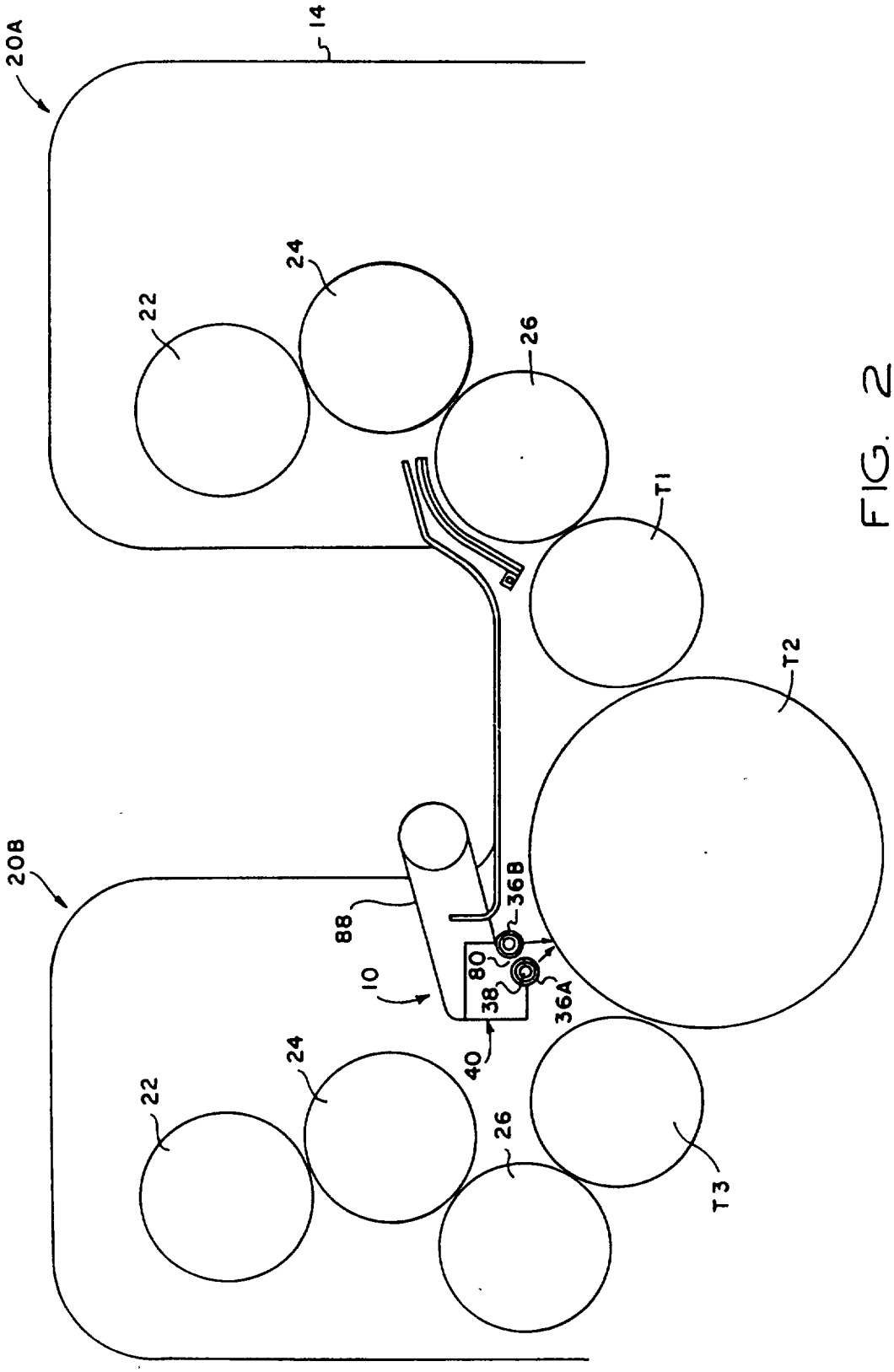


FIG. 2

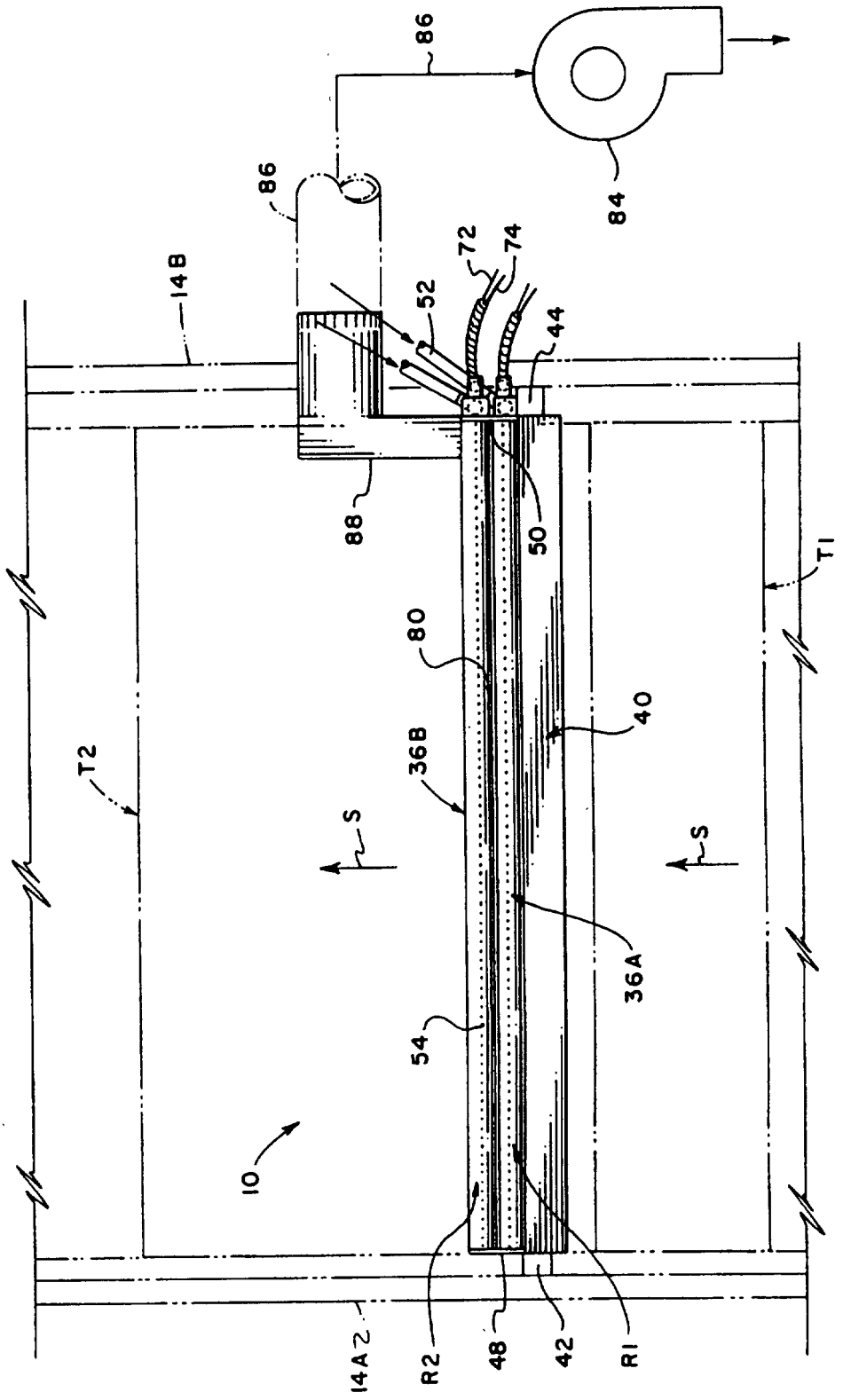

86
86
84
72
74
52
44
14B
88
50
T1
80
40
T2
36B
S
S
36A
54
10
14A
R2
48
42
R1

FIG. 3

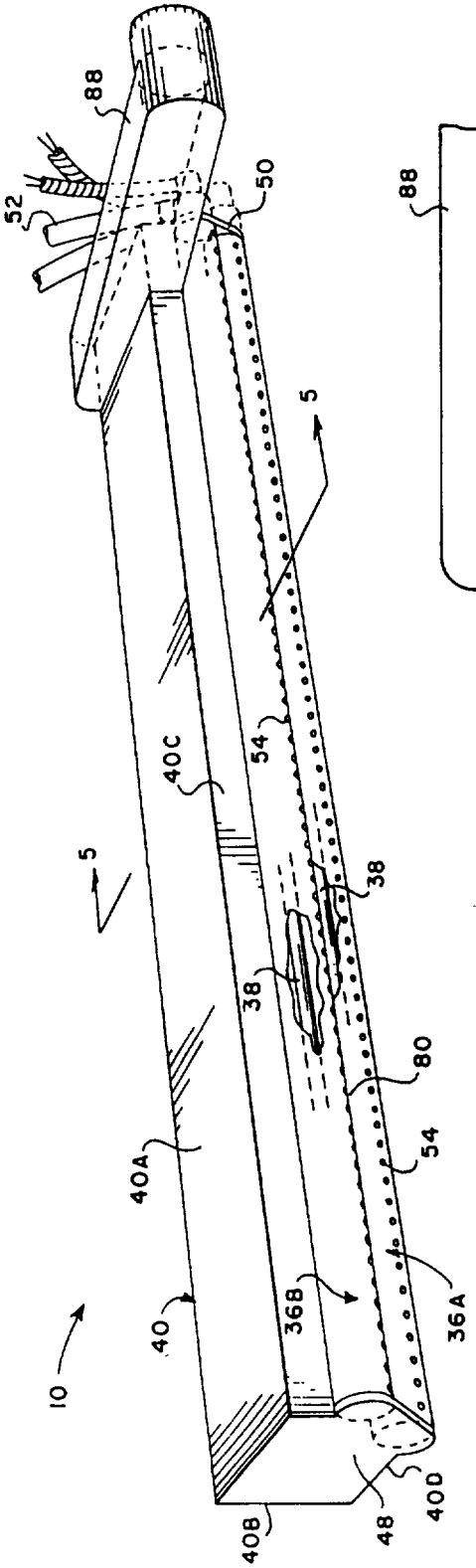

88
52
50
5
5
40C
54
38
38
80
54
40A
40
368
36A
10
48
400
408

FIG. 4

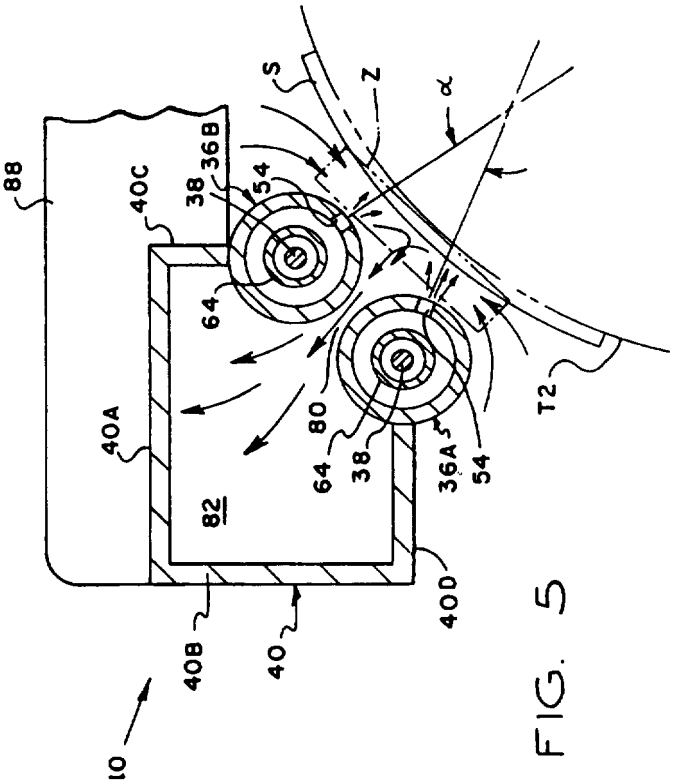

S
Z
α
88
40C
38
368
54
64
80
64
38
36A
54
T2
40A
82
400
408
40
10

FIG. 5

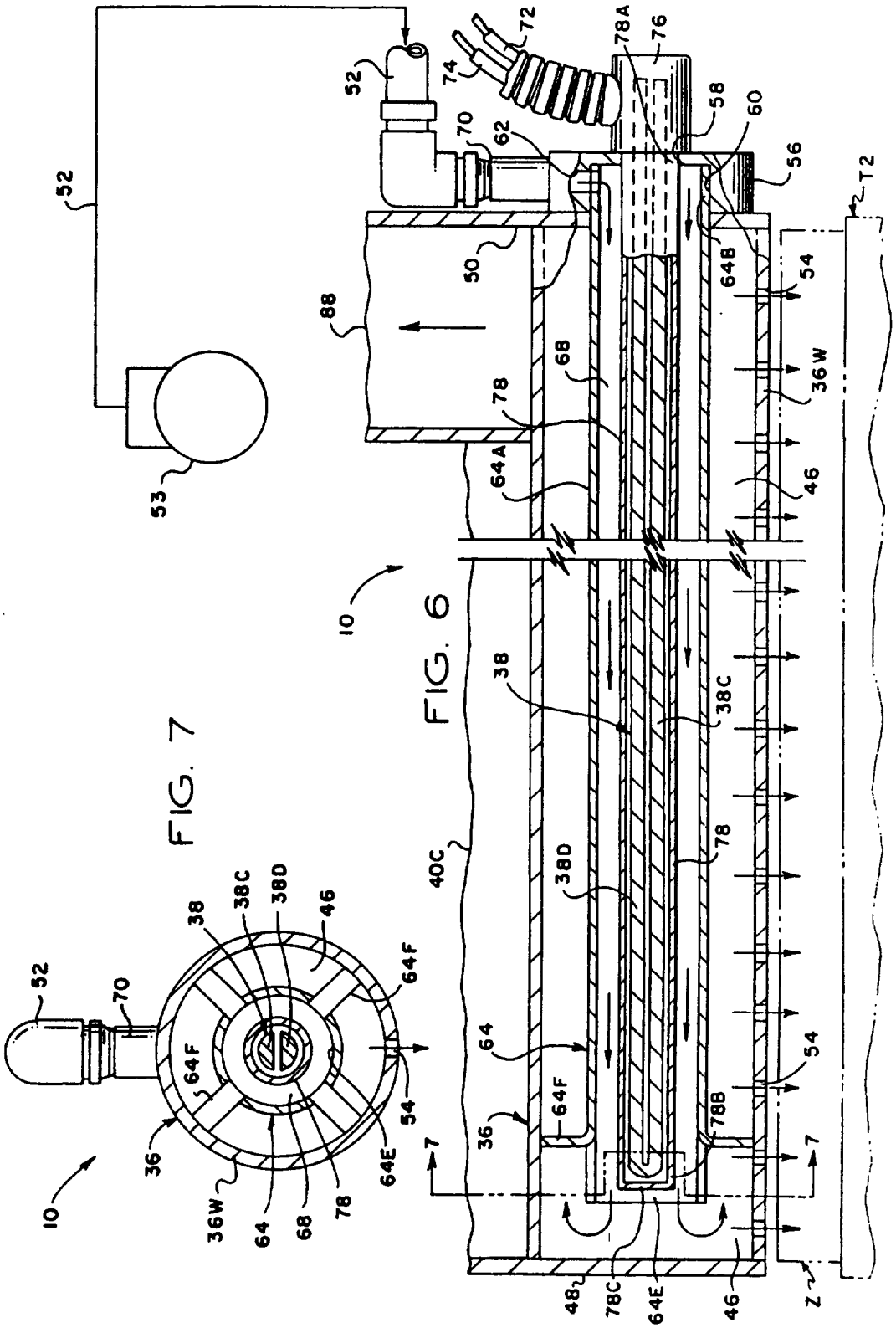

52
53
72
74
78A
76
58
60
56
62
70
50
88
68
78
64A
54
36W
46
T2
10
38
38C
38D
40C
64
64F
36
7
48
78C
64E
Z

FIG. 6

52
70
38
38C
38D
46
64F
54
36
64F
36W
64
68
78
64E
10

FIG. 7

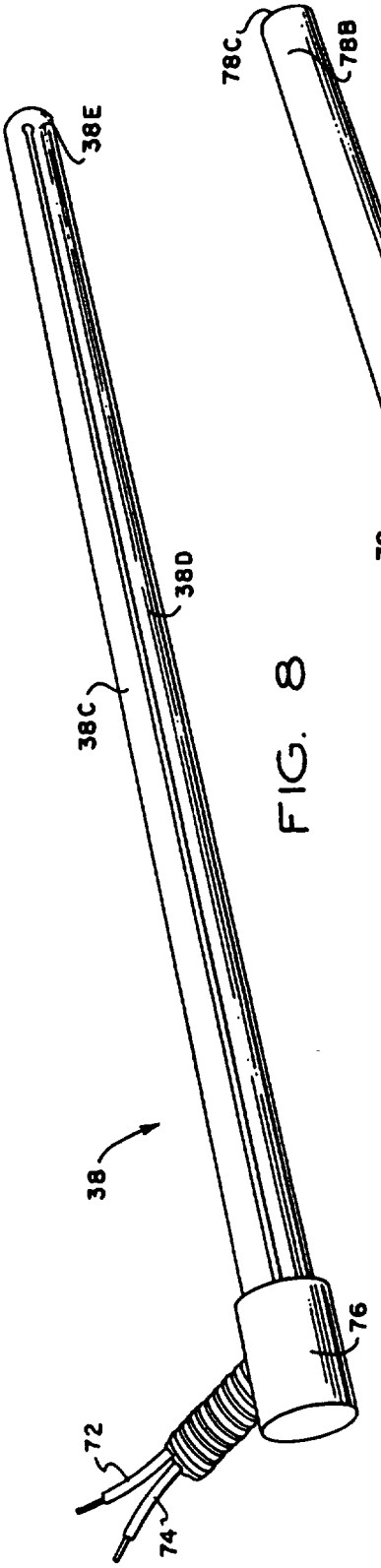


FIG. 8

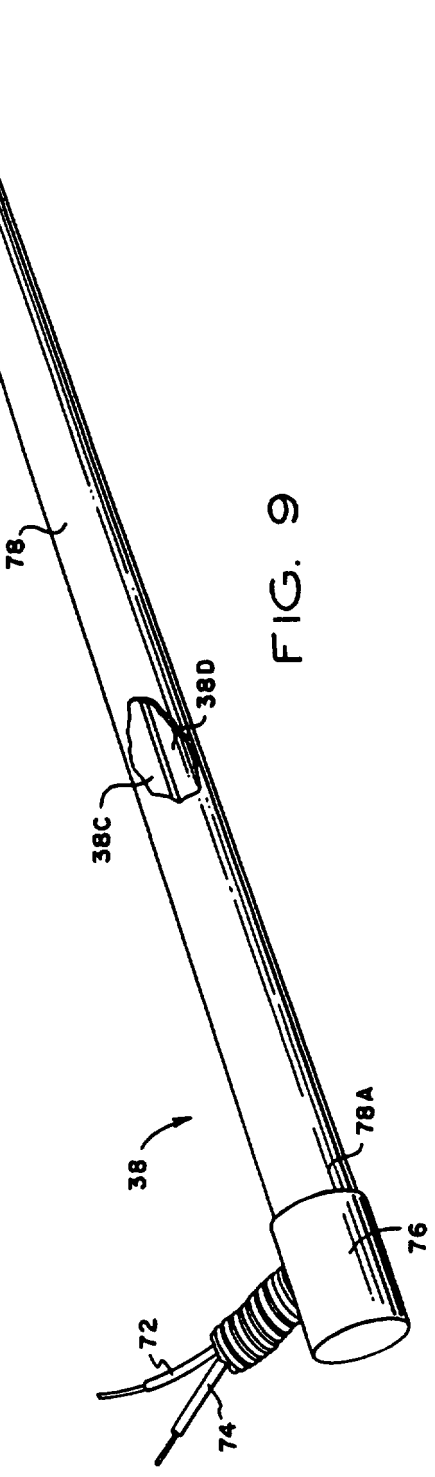


FIG. 9

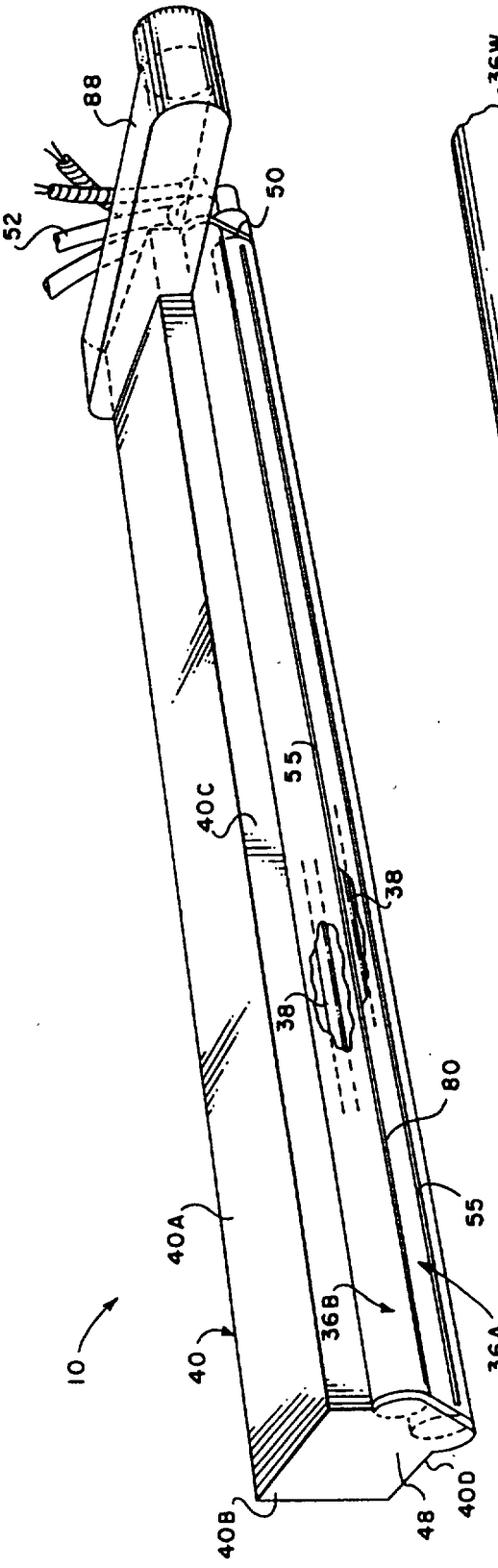


FIG. 10

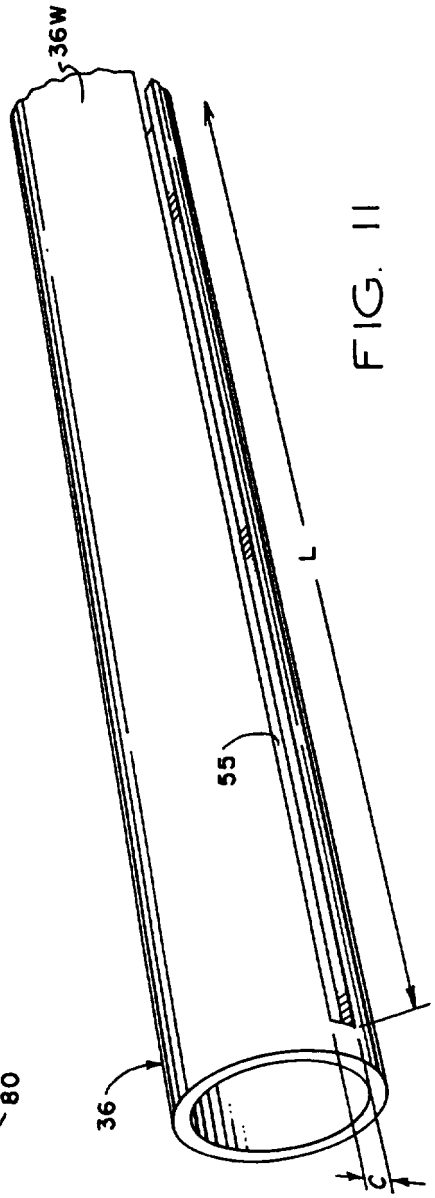


FIG. 11

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 94 30 5812

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION
X	US-A-2 683 939 (MASTER APPLIANCE) * the whole document *	1-4,6,7,10,16,17	B41F23/04 F26B21/00
Y		9,12,13,19,21,23	
Y	FR-A-1 340 311 (ATELIERS ET CHANTIERS DE NANTES) * the whole document *	9,13,19,21,23	
Y	US-A-1 737 174 (WILLIAM J. PRICE) * the whole document *	12	
A	US-A-3 079 702 (JAMES HALLEY & SONS)		
A	WO-A-90 03888 (PLATSCH)		

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

B41F
F26B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	16 January 1995	Loncke, J

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

8

Veredelung

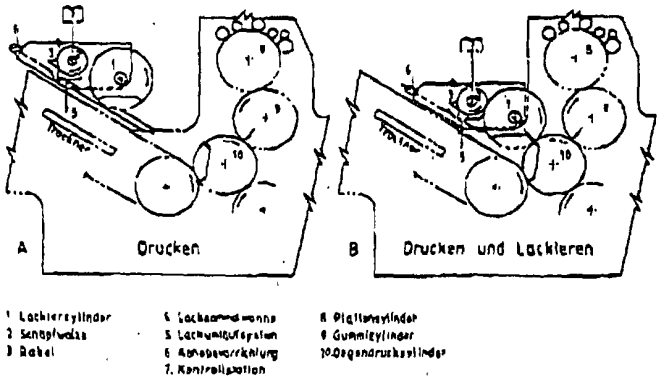
Lackier-Aggregat für Speedmaster-Maschinen

Mit einem Dahlgren-Lackierwerk LPC erhalten Speedmaster-Drucker die Möglichkeit, vorhandene Maschinen aufzurüsten, um nach wie vor mehrfarbig zu drucken und zusätzlich zu lackieren, ohne daß hierfür ein Druckwerk geopfert werden muß. Eine Vierfarben-Maschine zum Beispiel bleibt eine Vierfarben-Maschine, das Lackieren wird zusätzlich ermöglicht.

Der Einbau der LPC-Einheit erfolgt zwischen dem letzten Druckturm und dem Ausleger. Das Lackwerk kann durch Knopfdruck zur Ausgabe hin hydraulisch verfahren werden, wodurch für Service- und Einstellarbeiten der freie Zugang zum letzten Werk erhalten bleibt.

Da es sich bei der LPC-Einheit um ein echtes Lackierwerk handelt, ist sowohl Schutzlackierung als auch Hochglanzlackierung möglich; die gewünschte Lackauftragsmenge wird durch die Gravurtiefe der Schöpfwalze (Anilox-Walze) festgelegt. Vollflächige Lackierung ist ebenso möglich wie Spot-Lackierung, wobei ein Registersystem die passergenaue Lackübertragung erleichtert.

Je nach Bedarf kann UV- oder Dispersionslack eingesetzt werden. Ein Ablagern oder Austrocknen des Lacks wird durch ein kontinuierliches Umpumpen vermieden, was wiederum einen gleichmäßigen Lackauftrag gewährleistet.



Zeichnung A zeigt das Lackierwerk in ausgefahrener Position, Zeichnung B im Eingriff mit dem Druckwerk, das heißt in Lackierposition.

LPC-Lackierwerke sind zur Zeit für Speedmaster 72 und 102 sowie für Mitsubishi-Maschinen verfügbar.

Das Augsburger Lieferwerk informiert auch über Trocknungs-Systeme, und zwar sowohl über IR-Heißluft-Trocknung als auch über UV-Härtung

Aggregate

Optimierte Heiz- und Kühlwalzen

Eine deutlich verbesserte Zwangsführung der Kühl- und Heizmedien bei ihren Heiz- und Kühlwalzen hat die W. Hähl KG, Kieselbronn, durch Optimierungsmaßnahmen in der typischen Zapfen- und Bodenkonstruktion erreicht.

Entsprechende Heiz- und Kühlwalzen sind in Dimensionen von bis zu 1000 mm Durchmesser und von bis zu 10000 mm Länge lieferbar. Sorgfältig dynamisch ausgewuchtet verfügen sie über eine extreme Laufruhe und bieten über lange Betriebszeit sichere Funktion.

Druckvorstufe

Verbesserte Repetierkopiermaschinen

Die bisherigen Universal-Repetierkopier-Maschinen PC-801 und PC-802 von Screen, die bekanntlich auch als manuelle Kontaktkopierrahmen für die Plattenkopie genutzt werden können, wurden durch optimierte Konstruktionen abgelöst. Die drei Varianten des Modells PC-803 sind wie folgt ausgelegt:

- PC-803-E deckt die Maschinenklasse I ab (effektives Kopierformat 73 x 62 cm);
- PC-803-G ist für das IIIB-Format (77 x 103 cm) bestimmt;
- PC-803-I reicht bis zum Ver Format (131 x 105 cm).

Die grundsätzlichen Abläufe wurden beibehalten, die jetzt geschlossene Kompaktbauweise mit zusätzlichen automatischen Mechanismen ermöglicht aber staubfreieres Kopieren und mindert die Geräuschbelastung. Durch die neue UV-Lichtschutzscheibe kann der Bediener alle Abläufe visuell kontrollieren.

Bei den großen Modellen G und I fährt das Lampenhaus in seitlicher Richtung mit, und die bewegliche 4-kW - Metallhalogenidlampe verstellt sich auch in der Höhe automatisch. Dies gestattet bei kleineren Filmvorlagen (zum Beispiel Etiketten) oder im Bereich der Umschlagseitenproduktion eine noch bessere Ausleuchtung, höhere Lichtintensität und damit verkürzte Belichtungszeiten.

Einer eventuellen Lichthofbildung an der Maskenkante wird durch die bessere Maskenkonstruktion mit reduziertem Abstand zwischen Maske und Glasscheibe vorgebeugt.

Sobald bei den Kopier- und Montage-Maschinen ▶

9

OR04

TECHSOURCE Correspondence/Publication 1999/06/28
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.	2175731	009	ONE-TIME REMINDER NOTICE OF	1998/01/06	H	

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2175731

05/96 REQUEST FOR EXAMINATION DEMANDE D'EXAMEN	INFORMAL IRRÉGULIÈRE	INCOMPLETE	PCT	SPECIAL ORDER ORDONNANCE SPÉCIALE	CANADIAN CANADIENNE	FRENCH FRANÇAISE	DIVISION	REISSUE RE-DÉLIVRANCE	2175731

N° de demande de brevet / Patent file no. ▶ 2,175,731-4

Déposée le / Filed ▶ 96/05/03

Date de mise à la disponibilité du public / Laid - Open date ▶ 96/11/05

INT.CL[6]

B41F-001/40 B41F-003/81 B41F-007/36 B41F-015/40 B41F-005/24

Date de priorité - Priority date

U.S.A. (08/435,798) 19950504

Propriétaire - Owner

DeMoore, Howard W.

Inventeur - Inventor

DeMoore, Howard W.; Rendleman, Ronald M.; Bird, John W.

Invention

Retractable Inking/Coating Apparatus Having Ferris Movement Between Printing Units

AGENT

7006.021

Ogilvie & Company
Edmonton, Alberta

OPIC - CIPO 135 (12-95)

OGC, TECHNOLOGIE 1996

FLOOR ÉTAGE	CANADIAN SEARCH - RECHERCHE CANADIENNE		CANADIAN SEARCH - RECHERCHE CANADIENNE	
	CLASS - CLASSE	SUB-CLASS - SOUS-CLASSE	CLASS - CLASSE	SUB-CLASS - SOUS-CLASSE

REPORTS AND AMENDMENTS - RAPPORTS ET AMENDEMENTS	
REPT MLD RAPP EXP MAR - 8 1999	

CLAIMS AT ALLOWANCE REVENDICATIONS À L'ACCEPTATION	CLAIMS AT EDITORIAL REVENDICATIONS À L'ÉDITION
ALLOWED - ACCEPTÉE	
SIGNATURE OF EXAMINER - SIGNATURE DE L'EXAMINATEUR	
WITHDRAWN FROM ALLOWANCE - RETIRÉE DE L'ACCEPTATION	
RESTORED OR REINSTATED - RESTAURÉE OU RÉTABLIE	
SECOND ALLOWANCE - RÉACCEPTATION	
SIGNATURE OF EXAMINER - SIGNATURE DE L'EXAMINATEUR	
ABANDONED / LAPSED DUE TO MAINTENANCE FEE ABANDONNÉ / DUE A LA TAXE DE MAINTIEN	

7530-21-936-3234 (09-91))41

nbr demoore, howard w

SELECT LIST DEFAULT:
SELECT# RESULTS TERM
1 1 DEMOOR, STEPHEN J./IN
2 19 DEMOORE/PA
3 19 DEMOORE, HOWARD W./IN
4 3 DEMOPOLIS/IN
5 2 DEMOPOLIS, TOM N./IN
UP N OR DOWN N?

sel 3

SS 1 RESULT (19)

SS 2?
prt ti pn 1-19

-1- (USPA)
TI - Retractable printing/coating unit operable on the plate and blanket cylinders simultaneously from the dampener side of the first printing unit or any consecutive printing unit of any rotary offset printing press
PN - US5651316

-2- (USPA)
TI - Method and apparatus for handling printed sheet material
PN - US5603264

-3- (USPA)
TI - Retractable printing/coating unit operable on the plate and blanket cylinders
PN - US5598777

-4- (USPA)
TI - Delivery conveyor with control window ventilation and extraction system
PN - US5540152

-5- (USPA)
TI - Method and apparatus for handling printed sheet material
PN - US5511480

-6- (USPA)
TI - Vacuum transfer apparatus for rotary sheet-fed printing presses
PN - US5419254

-7- (USPA)
TI - Automatic coating circulation and wash-up system for printing presses
PN - US5367982

-8- (USPA)
TI - Coating apparatus for sheet-fed, offset rotary printing presses
PN - US5335596

-9- (USPA)
TI - Vacuum transfer apparatus for rotary sheet-fed printing presses
PN - US5243909

-10- (USPA)

TI - Vacuum transfer apparatus for rotary sheet-fed printing presses
PN - US5228391

-11- (USPA)
TI - Coating apparatus for sheet-fed, offset rotary printing presses
PN - US5207159

-12- (USPA)
TI - Vacuum transfer apparatus for rotary sheet-fed printing presses
PN - US5205217

-13- (USPA)
TI - Coating apparatus for sheet-fed, offset rotary printing presses
PN - US5176077

-14- (USPA)
TI - Vacuum transfer apparatus for rotary sheet-fed printing presses
PN - US5133255

-15- (USPA)
TI - Vacuum transfer apparatus for rotary sheet-fed printing presses
PN - US5127329

-16- (USPA)
TI - Net cartridge assembly for use with transfer and delivery cylinders in rotary printing presses
PN - US5046421

-17- (USPA)
TI - Anti-marking method and apparatus for use with perfector cylinders of rotary sheet-fed printing presses
PN - US5042384

-18- (USPA)
TI - Method and apparatus for attaching anti-smear net to printing press transfer cylinder
PN - US4691632

-19- (USPA)
TI - Method and apparatus for handling printed sheet material
PN - US4402267

SS 2?

?

rt fu 3-3

-3- (USPA)
PN - US5598777
TI - Retractable printing/coating unit operable on the plate and blanket cylinders
IN - DeMoore, Howard W., 10954 Shady Trail, Dallas (TX) US, 75220; Rendleman, Ronald M., Dallas (TX) US; Bird, John W., Carrollton (TX) US
PA - DeMoore, Howard W., Dallas, TX, US
PD - 97.02.04
AP - 95.10.02 95US-538274
NO - 19 CLAIMS, EXEMPLARY CLAIM 1, 10 DRAWINGS, 18 FIGURES
EXAMINER: Fisher, J. Reed
ATTY/AGENT: Sidley & Austin
PCL - 101177000, CROSS REFS: 101352000
IC - B41F-005/02, B41F-005/22, B41F-031/36
FLD - 101/349.000, 101/350.000, 101/351.000, 101/352.000, 101/207.000, 101/208.000-101/210.000, 101/363.000, 101/364.000, 101/147.000, 101/148.000, 101/143.000, 101/144.000, 101/217.000, 101/218.000, 101/177.000, 101/247.000, 118/258.000-118/262.000, 118/046.000, 118/263.000
DT - INVENTION PATENT
FS - TO US INDIVIDUAL
CT - US4308796, 1/1982, Satterwhite, 101/350.
US4706601, 11/1987, Jahn, 118/211.
AB - A retractable in-line inking/coating apparatus can apply either spot or overall inking/coating material to a plate and/or a blanket on the first printing unit or on any consecutive printing unit of any rotary offset printing press. The inking/coating apparatus is pivotally mounted within the conventional dampener space of any lithographic printing unit. The aqueous component of the flexographic printing ink or aqueous coating material is evaporated and dried by high velocity, hot air dryers and high performance heat and moisture extractors so that the aqueous or flexographic ink or coating material on a freshly printed or coated sheet is dry and can be dry-trapped on the next printing unit. The inking/coating apparatus includes dual cradles that support first and second applicator rollers so that the inking/coating apparatus can apply a double bump of aqueous/flexographic or UV-curable printing ink or coating material to a plate on the plate cylinder, while simultaneously applying aqueous, flexographic or UV-curable printing ink or coating material to a plate or a blanket on the blanket cylinder, and thereafter onto a sheet as the sheet is transferred through the nip between the blanket cylinder and the impression cylinder. A triple bump is printed or coated on the last printing unit with the aid of an impression cylinder inking/coating unit.
MCLM- What is claimed is: 1. A rotary offset printing press of the type including first and second printing units, the first printing unit comprising:

a plate cylinder having a flexographic printing plate mounted thereon;

a blanket cylinder having a blanket disposed in ink or coating transfer engagement with the flexographic printing plate for receiving aqueous or flexographic printing ink or coating material from the flexographic printing plate;

an impression cylinder disposed adjacent the blanket cylinder thereby forming a nip between the blanket and the impression cylinder whereby the aqueous or flexographic printing ink or coating material can

be transferred from the blanket to a substrate as the substrate is transferred through the nip;

inking/coating apparatus movably coupled to the first printing unit for movement to an on-impression operative position and to an off-impression retracted position;

the inking/coating apparatus including container means for containing a volume of aqueous or flexographic ink or coating material, and at least one applicator roller coupled to the container means for applying aqueous or flexographic ink or coating material to the flexographic printing plate or to the blanket when the inking/coating apparatus is in the on-impression operative position;

the container means having a partition dividing the container means thereby defining a first container region and a second container region;

the at least one applicator roller having first and second transfer surfaces and means separating the first and second transfer surfaces; and,

the first and second transfer surfaces of the at least one applicator roller being disposed within the first and second container regions for rolling contact with aqueous or flexographic printing ink or coating material contained within the first and second container regions, respectively.

SS 2?

-1- (USPA)
PN - US5651316
TI - Retractable printing/coating unit operable on the plate and blanket cylinders simultaneously from the dampener side of the first printing unit or any consecutive printing unit of any rotary offset printing press
IN - DeMoore, Howard W., 10954 Shady Trail, Dallas (TX) US, 75220; Rendleman, Ronald M., Dallas (TX) US; Bird, John W., Carrollton (TX) US
PA - DeMoore, Howard W., Dallas, TX, US
PD - 97.07.29
AP - 95.10.02 95US-538123 no corresponding Canadian
NO - 16 CLAIMS, EXEMPLARY CLAIM 1, 10 DRAWINGS, 18 FIGURES
EXAMINER: Eickholt, Eugene H.
ATTY/AGENT: Sidley & Austin
PCL - 101450100, CROSS REFS: 118046000, 101424100
IC - B41M-004/00
FLD - 101/424.100, 101/450.100, 101/135.000, 101/141.000, 101/142.000, 101/211.000, 101/216.000, 101/232.000, 101/348.000-101/349.000, 118/046.000
DT - INVENTION PATENT
FS - TO US INDIVIDUAL
CT - US3397675, 8/1968, De Ligt, 118/258.
US3433155, 3/1969, Norton, 101/148.
US3768438, 10/1973, Kumpf, 118/262.
US3800743, 4/1974, Egnaczak, 118/259.
US3916824, 11/1975, Knodel et al., 118/224.
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US4222325, 9/1980, Edwards, 101/137.
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US4446814, 5/1984, Abendroth, 118/694.
US4501223, 2/1985, Matsuno et al., 118/668.
US4524712, 6/1985, Ito, 118/46.
US4536218, 8/1985, Ganlto, 101/450.1.
US4569306, 2/1986, Ito et al., 118/249.
US4615293, 10/1986, Jahn, 118/46.
US4685414, 8/1987, DiRico, 118/46.
US4706601, 11/1987, Jahn, 118/46.
US4779557, 10/1988, Frazzitta, 118/46.
US4796528, 1/1989, Sarazen, 101/211.
US4796556, 1/1989, Bird, 118/46.
US4815413, 3/1989, Kota, 118/46.
US4825804, 5/1989, Kirico et al., 118/46.
US4841903, 6/1989, Bird, 118/46.
US4852515, 8/1989, Terasaka et al., 118/663.
US4934305, 6/1990, Koehler et al., 118/46.
US5107790, 4/1992, Sliker et al., 118/674.
US5176077, 1/1993, DeMoore et al., 101/232.
US5178678, 1/1993, Koehler et al., 118/46.
US5189960, 3/1993, Valentini, 101/349.
US5209179, 5/1993, Herbert et al., 118/46.
US5476041, 12/1995, Czotscher, 101/232.
AB - A retractable in-line inking/coating apparatus can apply either spot or overall inking/coating material to a plate and/or a blanket on the first printing unit or on any consecutive printing unit of any rotary offset

printing press. The inking/coating apparatus is pivotally mounted within the conventional dampener space of any lithographic printing unit. The aqueous component of the flexographic printing ink or aqueous coating material is evaporated and dried by high velocity, hot air dryers and high performance heat and moisture extractors so that the aqueous or flexographic ink or coating material on a freshly printed or coated sheet is dry and can be dry-trapped on the next printing unit. The inking/coating apparatus includes dual cradles that support first and second applicator rollers so that the inking/coating apparatus can apply a double bump of aqueous/flexographic or UV-curable printing ink or coating material to a plate on the plate cylinder, while simultaneously applying aqueous, flexographic or UV-curable printing ink or coating material to a plate or a blanket on the blanket cylinder, and thereafter onto a sheet as the sheet is transferred through the nip between the blanket cylinder and the impression cylinder. A triple bump is printed or coated on the last printing unit with the aid of an impression cylinder inking/coating unit.

MCLM- What is claimed is: 1. A method for printing in a rotary offset press of the type including first and second printing units, the first printing unit having a flexographic printing plate, a blanket, an impression cylinder and inking/coating applicator means for applying aqueous or flexographic printing ink or coating material to the flexographic printing plate and/or to the blanket, comprising the following steps performed in succession in the first printing unit:

applying a first spot or overall coating of aqueous or flexographic printing ink or coating material to the flexographic printing plate;

transferring the aqueous or flexographic printing ink or coating material from the flexographic printing plate to the blanket;

applying a second spot or overall film of aqueous or flexographic printing ink or-layer of coating material to the blanket;

transferring ink or coating material from the blanket to a substrate as the substrate is transferred through the nip between the blanket and the impression cylinder; and,

drying the aqueous or flexographic ink or coating material on the freshly printed or coated substrate before the substrate is printed, coated or otherwise processed on the second printing unit.

SS 2?

Ogilvie and Company
1400 Metropolitan Place
10303 Jasper Avenue
EDMONTON Alberta
T5J 3N6

MAR - 8 1999

Application No.	:	**2,175,731**
Owner	:	DeMoore, Howard W.
Title	:	RETRACTABLE INKING/COATING APPARATUS HAVING FERRIS MOVEMENT BETWEEN PRINTING UNITS
Classification	:	B41F-1/40
Your File No.	:	**7006.021**
Examiner	:	**Ewa Chmura-Nadeau**

IN ACCORDANCE WITH SUBSECTION 30(2) OF THE PATENT RULES, YOU ARE HEREBY NOTIFIED OF A REQUISITION BY THE EXAMINER. IN ORDER TO AVOID ABANDONMENT UNDER PARAGRAPH 73(1)(A) OF THE PATENT ACT, A WRITTEN REPLY MUST BE RECEIVED WITHIN 6 MONTHS AFTER THE ABOVE DATE.

This application has been examined as originally filed.

The number of claims in this application is 22.

A search of the prior art has thus far failed to reveal any pertinent references. ←

The examiner has identified the following defects in the application:

Claim 18 is indefinite and does not comply with Subsection 27(4) of the Patent Act. The following terms have no antecedents:

"plate" (claim 18, line 23);
"blanket" (claim 18, line 1);
"inked or coated image" (claim 18, line 6); and
"nip" (claim 18, line 8).

In view of the foregoing defects, the applicant is requisitioned to amend the application in order to comply with the Patent Act and the Patent Rules or to provide arguments as to why the application does comply.

D. P.

Under Section 29 of the Patent Rules, applicant is requisitioned to provide an identification of any prior art cited in respect of the corresponding United States and European Patent Office applications and the patent numbers, if granted. Amendment to avoid references cited abroad may expedite the prosecution. If the particulars are not available to the applicant, the reason why must be stated.

Ewa Chmura-Nadeau
Patent Examiner
(819) 997-2819
2175731A.ECN

PETITION

US

The Petition of **HOWARD W. DeMOORE**, whose full post office address is 10954 Shady Trail, Dallas, Texas 75220, U.S.A.

SHEWETH:

(1) THAT, Howard W. DeMoore, Ronald m. Rendleman and John W. Bird, whose full post office addresses are (respectively) 10954 Shady Trail, Dallas, Texas 75230, U.S.A.; 4331 Royal Ridge, Dallas, Texas 75229, U.S.A.; and 1514 Iroquois Circle, Carrollton, Texas 75007, U.S.A. made the invention entitled RETRACTABLE INKING/COATING APPARATUS HAVING FERRIS MOVEMENT BETWEEN PRINTING UNITS which is described and claimed in the specification submitted herewith.

(1a) THAT the entire right to obtain a patent for the said invention has been assigned to Your Petitioner.

(2) THAT your Petitioner verily believes that he is entitled to a patent for the said invention having regard to the provisions of the Patent Act.

(2.1) THAT your Petitioner verily believes that he is entitled to pay a filing fee as a small entity as defined in Section 2 of the Patent Rules.

(3) Your Petitioners request that this application be treated as entitled to the rights accorded by Section 28(1) of the said Act having regard to the application of which particulars are set out below, and represents that the said application is the first application for patent for the said invention filed in any country which by treaty, convention or law affords similar rights to citizens of Canada by the inventors or any one claiming under him.

U.S. Patent Application No. 08/435,798 filed on May 4, 1995

US-95-05-04

(4) THAT your Petitioner hereby nominates OGILVIE AND COMPANY, carrying on business in Canada at the following address 1400 Metropolitan Place, 10303 Jasper Avenue, Edmonton, Alberta, T5J 3N6, to be his representative for the service of any proceedings taken under the Act.

(5) THAT your Petitioner hereby appoints OGILVIE AND COMPANY, having a post office address is 1400 Metropolitan Place, 10303 Jasper Avenue, Edmonton, Alberta, T5J 3N6, as his agent, with full power to appoint an associate agent when required to do so by Section 131 of the Patent Rules and to revoke such appointment, to sign the petition and drawings, to amend the specification and drawings, to prosecute the application, and to receive the patent granted on the said application; and ratify any act done by the said appointee in respect of the said application.

(6) YOUR Petitioner therefore prays that a patent may be granted to him for the said invention.

SIGNED at Edmonton, Alberta, this 2nd day of May, 1996.

OGILVIE AND COMPANY

Per: EP Johnson

E. PETER JOHNSON
Agents for the Applicant

OPIC
Office de la propriété intellectuelle du Canada

CIPO
Canadian Intellectual Property Office

Ottawa Hull K1A 0C9

(21) (A1) 2,175,731
(22) 1996/05/03
(43) 1996/11/05

(51) Int.Cl.[6] B41F 1/40; B41F 3/81; B41F 7/36; B41F 15/40; B41F 5/24

(19)(CA) **APPLICATION FOR CANADIAN PATENT** (12)

(54) Retractable Inking/Coating Apparatus Having Ferris Movement Between Printing Units

(72) DeMoore, Howard W. - U.S.A. ;
Rendleman, Ronald M. - U.S.A. ;
Bird, John W. - U.S.A. ;

(71) DeMoore, Howard W. - U.S.A. ;

(30) (US) 08/435,798 1995/05/04

(57) 22 Claims

"RETRACTABLE INKING/COATING APPARATUS HAVING FERRIS MOVEMENT BETWEEN PRINTING UNITS"

ABSTRACT

A retractable in-line inking/coating apparatus selectively applies either spot or overall ink/coating material to a blanket or flexographic plate on a blanket cylinder, or spot or overall ink/coating to a flexographic printing plate on a plate cylinder in a rotary offset printing press. The inking/coating apparatus is pivotally mounted on the tower of a printing unit or dedicated coating unit, and is extendable into and retractable out of an inking/coating position by a carriage assembly which is pivotally coupled to the printing unit tower. Because of the pivotal support provided by a cantilevered support arm, the inking/coating apparatus is extended and retracted through a Ferris wheel arc between adjacent printing units.

"RETRACTABLE INKING/COATING APPARATUS HAVING FERRIS MOVEMENT BETWEEN PRINTING UNITS"

This invention relates to sheet-fed or web-fed, rotary offset or flexographic printing presses, and more particularly, to a new and improved inking/coating apparatus for the in-line application of printing inks or protective or decorative coatings to sheet or web substrates.

Conventional sheet-fed, rotary offset printing presses typically include one or more printing units through which individual sheets are fed and printed with wet ink. Since the inks used with rotary offset printing presses typically remain wet and tacky for some time after printing, special precautions must be taken to insure that the freshly printed sheets are not marked or smeared as the sheets are transferred from one printing unit to another, and while being conveyed to the sheet delivery stacker. The printed surface of the freshly printed sheet dries relatively slowly and can be smeared during subsequent transfer between printing units. In order to reduce smearing and offsetting, spray powder is applied on the printed sheet.

In some printing applications, offset and smearing are prevented by applying a protective and/or decorative coating over all or a portion of the freshly printed sheets. Various arrangements have been proposed for applying the protective or decorative coating as an in-line operation by using the last printing unit of the press as the coating application unit. However, when such in-

line coating is performed, the last printing unit cannot be used to apply ink to the sheets, and can only be used for the coating operation. Thus, while coating with these types of in-line coating apparatus, the press loses the capability of printing its full range of colors since the last printing unit is converted to a coating unit.

It will be appreciated that the time required to reconfigure a press for coating or non-coating is non-productive and costly. Accordingly, there is a need for an in-line coating apparatus that minimizes the time to clean-up from one printing run and set-up and run the next job. Where consecutive jobs require the same type of coating, particularly blanket coating, it may not be necessary to clean-up the coater between jobs. However, the coating material cannot be allowed to dry on the rollers. Therefore, especially when switching from blanket to spot coating or vice versa, or if there is a delay between jobs, it is necessary to wash-up the coater after each job is completed.

In addition, coater wash-up is necessary when switching between different coating compositions, such as aqueous and ultra violet (UV) curable coatings. Such coating materials are not interchangeable, and consequently, the coater must be washed between applications of different coating media.

The foregoing limitations are overcome, according to the present invention, by a retractable, in-line inking/coating apparatus which is mounted on a printing

unit for pivotal, Ferris wheel movement between an operative inking/coating position and a retracted, overhead idle position. The inking/coating apparatus includes an applicator head which, is positioned in alignment with either the plate cylinder or the blanket cylinder by a carriage assembly which includes a cantilevered support arm. The support arm is pivotally coupled between the inking/coating head and the printing unit tower. This cantilevered, pivotal mounting arrangement allows the inking/coating unit to be used between two printing units, as well as on the last printing unit of the press.

In the preferred embodiment, the applicator head includes vertically spaced pairs of cradle members with one cradle pair being adapted for supporting a metal or ceramic coating roller in alignment with a blanket cylinder, and the other cradle pair supporting a resilient anilox coating roller in alignment with the plate cylinder, respectively, when the carriage assembly is in the operative position. Because of the cantilevered, pivotal support provided by the support arm, the applicator head can be lifted and lowered through an arc, similar to Ferris wheel movement, in the limited space between adjacent printing units. When fully retracted, the applicator head and carriage assembly are lifted to an elevated, retracted overhead position, preferably an overhead position overlying the printing unit tower, thus providing complete access to the interstation space and the printing unit cylinders without causing the printing unit to lose its printing capability. The

inking/coating applicator roller of the applicator head can be inspected, cleaned or replaced and the doctor blade assembly can be washed-up automatically while the inking/coating apparatus is in the retracted position.

When the inking/coating apparatus is used in combination with a flexographic printing plate and aqueous ink or aqueous coating, the water component of the aqueous ink or coating on the freshly printed sheet is evaporated by a high velocity, hot air interstation dryer and a high volume heat and moisture extractor assembly so that the freshly printed ink or coating is completely dry before the sheet is printed on the next printing unit. This quick drying flexographic printing/coating arrangement permits a base coat of ink, for example opaque white or metallic ink (gold, silver or other metallics) to be applied in the first printing unit, and then overprinted by a lithographic process on the next printing unit.

Broadly stated, the invention is an inking/coating apparatus for use in a printing press of the type having a printing unit on which a plate cylinder, a blanket cylinder and an impression cylinder are mounted for rotation, wherein the inking/coating apparatus is characterized by: an applicator head for applying ink or coating material to a plate mounted on the plate cylinder or to a blanket mounted on the blanket cylinder, either separately or simultaneously when the inking/coating apparatus is in an operative position relative to the plate and blanket cylinders; and, a carriage assembly for moving the applicator head to the operative position in which the applicator head is disposed laterally adjacent to the plate and blanket cylinders and for moving the applicator head from the operative position to a retracted position in which the applicator head is elevated with respect to the plate and blanket cylinders.

In another broad aspect, the invention is a method for rotary offset printing in a printing press of the type including first and second rotary offset printing units, and using aqueous or UV-curable printing ink or coating material in the operation of at least the first printing unit, characterized by the following steps performed at each printing unit in succession: spot or overall coating the plate with aqueous ink/aqueous coating material or UV-curable ink/UV-curable coating material; spot and/or overall coating the blanket with aqueous ink/aqueous coating material or UV-curable

ink or UV-curable coating material; transferring the printing ink or coating material from the printing plate to the blanket; transferring the inked or coated image from the blanket to a substrate as the substrate is transferred through the nip between the impression cylinder and the blanket; and, drying the ink or coating material on the freshly printed substrate before the substrate is subsequently processed.

Exemplary embodiments of the present invention are illustrated in the drawing figures wherein:

FIGURE 1 is a schematic side elevational view of a sheet-fed, rotary offset printing press having inking/coating apparatus embodying the present invention;

FIGURE 2 is a perspective view of the printing press of FIGURE 1 in which a dual head inking/coating apparatus is in the operative coating position and a single head coater is in a retracted, overhead position;

FIGURE 3 is an enlarged simplified perspective view showing one side of the single head inking/coating apparatus of FIGURE 1 in the operative position;

FIGURE 4 is a simplified side elevational view showing the dual head inking/coating apparatus in the operative coating position for spot or overall coating from the blanket position;

FIGURE 5 is a simplified side elevational view showing the single head inking/coating apparatus in the operative coating position for spot or overall coating from the plate position; and,

FIGURE 6 is a simplified side elevational view of the dual head inking/coating apparatus of FIGURE 4, partially broken away, which illustrates the hydraulic drive assembly and doctor blade assembly.

As used herein, the term "processed" refers to various printing methods which may be applied to either side of a substrate, including the application of UV-curable and aqueous inks and/or coatings. The term "substrate" refers to sheet or web material. Also, as used herein, the term "waterless printing plate" refers to a printing plate having non-image surface areas which are hydrophobic and also having image surface areas which are hydrophilic, wherein the non-image surface areas are characterized by a surface tension value which is less than the surface tension of aqueous ink, and the image surface areas are characterized by a surface tension value which is greater than the surface tension of aqueous ink. "Flexo-

graphic" refers to flexible printing plates having a relief surface which is wettable by aqueous ink or aqueous coating material.

As shown in the exemplary drawings, the present invention is embodied in a new and improved in-line inking/coating apparatus 10, for applying inks or protective and/or decorative coatings to sheets or webs printed in a sheet-fed or web-fed, rotary offset or flexographic printing press, herein generally designated 12. In this instance, as shown in FIGURE 1, the inking/coating apparatus 10 is installed in a four color printing press 12, such as that manufactured by Heidelberger Druckmaschinen AG of the Federal Republic of Germany under its designation Heidelberg Speedmaster 102V. The press 12 includes a press frame 14 coupled at one end, herein the right end, to a sheet feeder 16 from which sheets, herein designated S, are individually and serially fed into the press, and at the opposite end, with a sheet delivery stacker 20 in which the freshly printed sheets are collected and stacked. Interposed between the sheet feeder 16 and the sheet delivery stacker 20 are four substantially identical rotary offset printing units 22, 24, 26 and 28 which can print different color inks onto the sheets as they are transferred through the press 12. The printing units are housed within printing towers T1, T2, T3 and T4 formed by side frame members 14, 15.

As illustrated, the printing units 22, 24, 26 and 28 are substantially identical and of conventional design.

The first printing unit 22 includes an in-feed transfer cylinder 30, a plate cylinder 32, a blanker cylinder 34 and an impression cylinder 36, all supported for rotation in parallel alignment between the press side frames 14, 15. Each of the first three printing units 22, 24 and 26 have an interunit transfer cylinder 38 disposed to transfer the freshly printed sheets from the adjacent impression cylinder to the next printing unit via an interstation transfer cylinder 40. The last printing unit 28 is shown equipped with a delivery cylinder 42 which guides each freshly printed sheet 18 as it is transferred from the last impression cylinder 36 to a delivery conveyor system, generally designated 44, to the sheet delivery stacker 20.

The delivery conveyor system 44 as shown in FIGURE 2 is of conventional design and includes a pair of continuous delivery gripper chains 46, only one of which is shown carrying at regular spaced locations along the chains, laterally disposed gripper bars having gripper fingers for gripping the leading edge of a freshly printed sheet 18 after it leaves the nip between the delivery cylinder 42 and impression cylinder 36 of the last printing unit 28. As the leading edge is gripped by the grippers, the delivery chains 46 pull the freshly printed sheet away from the impression cylinder 36 and deliver the freshly printed sheet to the sheet delivery stacker 20.

Prior to reaching the delivery sheet stacker, the freshly printed and/or coated sheets S pass under a delivery dryer 48 which includes a combination of infra-red

thermal radiation, high velocity hot air flow and heat and moisture extraction for drying the ink and/or the protective/decorative coating on the freshly printed sheets.

In the exemplary embodiment shown in FIGURE 1, the first printing unit 22 is equipped with a flexographic printing plate, and does not require an inking roller train or a dampening system. If an ink roller train is mounted on the first printing unit, the form rollers are retracted and locked off when the printing unit goes on impression. Flexographic aqueous ink is supplied by the inking/coating unit 110. The remaining printing units 24, 26 and 28 are equipped for lithographic printing and include an inking apparatus 50 having an inking roller train 52 arranged to transfer ink from an ink fountain 54 to the plate cylinder 32. This is accomplished with the aid of a fountain roller 56 and a ductor roller. The fountain roller 56 projects into the ink fountain 54, whereupon its surface is wetted with printing ink Q. The printing ink Q is transferred intermittently to the inking roller train 52 by the ductor roller. The inking roller train 52 supplies printing ink Q to the image ares of a printing plate P mounted on the plate cylinder 32.

The printing ink Q is transferred from the printing plate P to an ink receptive blanket B which is mounted on the blanket cylinder 34. The inked image carried on the blanket B is transferred to a sheet S as the sheet is transferred through the nip between the impression cylinder 36 and the blanket B.

The inking roller arrangement 52 illustrated in FIGURE 1 is exemplary for use in combination with lithographic ink printing plates. It will be understood that dampening rollers (not illustrated) will be in direct engagement with the lithographic plate P, but are not used in combination with the flexographic plate of printing unit 22.

Referring now to FIGURE 4, FIGURE 5 and FIGURE 6, the in-line inking/coating apparatus 10 includes a carriage assembly 58 which supports an applicator head 60. The applicator head 60 includes a hydraulic motor 62, a lower gear train 64, an upper gear train 65, an applicator roller 66 and a doctor blade assembly 68. The external peripheral surface of the applicator roller 66 is inserted into wetting contact with liquid coating material or ink contained in a reservoir 70. The reservoir 70 is continuously supplied with ink or coating which is circulated through the reservoir 70 from an off-press source by a pump (not illustrated). The hydraulic motor 62 drives the applicator roller 66 synchronously with the plate cylinder 32 and the blanket cylinder 34 in response to an RPM control signal from the press drive (not illustrated) and a feedback signal developed by a tachometer 72. While a hydraulic drive motor is preferred, an electric drive motor can be used.

The applicator roller 66 is preferably a fluid metering anilox roller which transfers measured amounts of printing ink or coating material onto the printing plate or

blanket. The surface of an anilox roller is engraved with an array of closely spaced, shallow depressions referred as "cells". Ink or coating material from the reservoir 70 flows into the cells as the anilox roller turns through the reservoir. The transfer surface of the anilox roller is scraped with a doctor blade 73 to remove excess ink or coating. The ink or coating remaining on the anilox roller is the measured amounts contained within the cells.

The applicator roller 66 is cylindrical and may be constructed in various diameters and lengths, containing cells of various sizes and shapes. The volumetric capacity of an anilox roller is established during manufacturing and is dependent upon the selection of cell size, shape and number of cells per unit area. Depending upon the intended application, the cell pattern may be fine (many small cells per unit area) or coarse (fewer larger cells per unit area).

By applying the ink or coating material through the inking/coating applicator head 60, more ink or coating material can be delivered to the sheet S as compared with the inking roller train of a lithographic printing unit. Moreover, color intensity is stronger and more brilliant because the flexographic ink is applied at a much larger film thickness than can be applied by the lithographic process and is not diluted by dampening solution.

The inking/coating applicator head 60 includes side frame members 74, 76 that support the applicator roller 66, gear train 64, gear train 65, doctor blade

assembly 68 and the drive motor 62. The applicator roller 66 is supported at opposite ends on a lower cradle formed by a pair of end plates 78, 80 which hold the applicator roller 66 in parallel alignment with the blanket cylinder 34 (FIGURE 5). The side frames 74, 76 are also provided with an upper cradle formed by a pair of side plates 82, 84 which are vertically spaced with respect to the lower side plates 78, 80. Each cradle has a pair of sockets 79, 81 and 83, 85, respectively, for holding the applicator roller 66 for spot coating or inking engagement against the plate P of the plate cylinder 32 (FIGURE 4) or the blanket B of the blanket cylinder 34.

Preferably, the applicator roller 66 for the upper cradle (plate) position is an anilox roller having a resilient transfer surface. In the dual cradle arrangement, the press operator can quickly change over from blanket inking/coating and plate inking/coating with minimum press down time, since it is only necessary to remove and reposition or replace the applicator roller 66, and wash-up the doctor blade assembly if changing from ink to coating or vice versa. The capability to selectively operate in either the flexographic mode or the lithographic mode and to print or coat from either the plate or blanket position is referred to herein as the "LITHOFLEX" process.

Referring again to FIGURE 2 and FIGURE 3, the applicator head 60 is supported by the carriage assembly 58 in a cantilevered, pivotal arrangement which allows the dual cradle inking/coating apparatus 10 and a single cradle

inking/coating apparatus 110 to be used between any two adjacent printing units, as well as used on the first and last printing units of the press. This is made possible by a pair of cantilevered support arms 88, 90 that are pivotally coupled to the side plates 74, 76, respectively, on a pivot shaft 77. Each support arm has a hub portion 88A, 90A, respectively, and an elongated shank portion 88B, 90B, respectively.

The cantilevered support arms are pivotally mounted on the printing tower by pivot blocks 92, 94, respectively. The hub portions 88A, 90A are journalled for rotation on pivot shafts 96, 98, respectively. The pivot blocks 92, 94 are securely fastened to the tower 14D, so that the carriage assembly 86 is pivotally suspended from the pivot shafts 96, 98 in a cantilevered Ferris support arrangement. The shank portions 88B, 90B are pivotally coupled to the pivot shaft 77, so that the carriage assembly 58 and the applicator head 60 are capable of independent rotation with respect to each other and with respect to the pivot shaft 77. By this arrangement, the applicator head 60 is pivotally suspended from the pivot shaft 77, and remains in an upright orientation as the support arms rotate from the operative position to the fully retracted position, and vice versa.

Thus, the cradles 78, 80 and 82, 84 position the applicator roller 66 in vertical and horizontal alignment with the plate cylinder or blanket cylinder when the applicator head is extended to the operative position, for

example as shown in FIGURE 4 and FIGURE 5. Moreover, because of the transverse relationship between the hub portion and shank portion of the support arms, the applicator head 60 and carriage assembly 58 are capable of rotating through a Ferris arc without touching the adjacent printing tower. This makes it possible to install the inking/coating apparatus 10 on any intermediate printing unit tower (T2, T3), and as well as on the first printing unit tower T1 and the last printing unit tower T4. Additionally, when the inking/coating unit 10 is in the operative position, the lateral projection of the applicator head 60 into the interstation space between printing units is minimized. This assures virtually unrestricted operator access to the interstation space between adjacent printing units when the applicator head is engaged in the operative position, and completely unrestricted access when the carriage assembly 58 is retracted.

Rotation of the carriage assembly 58 is counterclockwise from the retracted, idle position (shown in phantom in FIGURE 1) to the operative position (FIGURE 4 and FIGURE 5). The carriage assembly 58 can be adapted for clockwise rotation from the retracted position to the operative position for engagement of the applicator roller to either the plate or the blanket on the dampener side of the tower, assuming that access to the plate and blanket is not restricted by dampener rollers or the like.

Rotational movement of the support arms 88, 90 is assisted by counterweights 100, 102 which are secured to

the support arms, respectively, for concurrent rotation with respect to the pivot blocks 92, 94. With the passive assistance of the counterweights, the press operator can easily move the inking/coating assembly 10 from the engaged operative position as shown in FIGURE 4 to the fully retracted, idle position as shown in phantom in FIGURE 1. Preferably, rotation of the carriage assembly 58 is assisted by a torsion spring, electric motor or hydraulic motor.

The inking/coating apparatus 10 is releasably locked into the operative position as shown in FIGURE 4 by releasable latch couplings 103, 105 that secure the support arms 88, 90 to the press side frames 14, 15, respectively, of the printing unit tower T4 in the operative position. Coating engagement of the applicator roller 66 against the blanket cylinder 34 is produced by power actuators, preferably pneumatic cylinders 104, 106 which have extendable/retractable power transfer arms 104A, 106A, respectively. The pneumatic cylinder 104 is pivotally coupled to the support arm 88 by a pivot linkage 108, and the second pneumatic cylinder 106 is pivotally coupled to the support arm 90 by a pivot linkage 109. In response to actuation of the pneumatic cylinders 104, 106, the power transfer arms are retracted. As the transfer arms retract, the inking/coating head 60 is rotated counterclockwise on the pivot shaft 77, thus moving the applicator roller 66 into coating engagement with the blanket cylinder 34.

The pivot linkage 108 includes a bell crank 111 which is mounted for pivotal movement on a pin 113. The pin 113 is supported by a clevis plate 115 which is attached to the support arm 88. One end of the bell crank is pivotally coupled to the actuator arm 104A, and a cam roller 117 is mounted for rotation on its opposite end.

The cam roller 117 is engagable against an adjustable stop 119 which is rigidly secured to the side plate 74. Counterclockwise shifting of the handle H moves a cam follower 121 into a latch pocket 123 of a receiver block 125 as the cam roller 117 is moved into engagement with the adjustable stop 119 in the interlocked, operative position. Referring to FIGURE 4, FIGURE 5 and FIGURE 6, the receiver block 125 is secured to the delivery side of the printing unit tower by machine screws.

When the plate P goes on impression, power is applied to the pneumatic actuator 104 and the power transfer arm 104A retracts, thus causing the bell crank 111 to rotate counterclockwise about the pin 113. The torque applied by the pneumatic actuator 104 is transmitted to the applicator head 60 through the cam roller 117 and the adjustable stop 119. Counterclockwise movement of the applicator head 60 relative to the support shaft 77 carries the applicator roller 66 into engagement with the plate P.

The adjustable stop 119 has a threaded bolt 119A which is engagable with the cam roller 117. The striking point of engagement is preset so that the applicator roller 66 is properly positioned for engagement with the plate P

or blanket B in the operative position when the applicator head 60 is interlocked with the press frame 14 and the printing unit goes on impression.

Referring to FIGURE 5, an inking/coating apparatus 110 having a single head is illustrated. The construction of this alternative embodiment is identical in all respects with the dual head arrangement, with the exception that only a single gear train and a single cradle for holding the applicator roller is provided. In both embodiments, the inking/coating head 60 remains upright as it swings through an arc, comparable to the movement of a Ferris wheel. Because of the upright orientation of the inking/coating head 60 as it moves between the extended and retracted positions, the usual platform spacing between printing unit towers provides adequate clearance to permit extension and retraction of the carriage assembly 58 without interference with operator access to the printing units. This is a significant advantage in that it permits the in-line inking/coating apparatus 10 to operate effectively in the interstation space between any adjacent printing units, and without blocking or obstructing access to the cylinders of the printing units when the inking/coating apparatus is in the retracted position (as indicated in phantom in FIGURE 1).

Moreover, when the in-line inking/coating apparatus is in the fully retracted position, the applicator roller 66 is conveniently positioned on the dampener side of the printing unit for inspection, clean-up or

replacement. Additionally, the doctor blade assembly is also conveniently positioned for inspection, removal, adjustment or clean-up. Also, the doctor blade reservoir and coating circulation lines can be cleaned while the press is running as well as when the press has been stopped for change-over from one type of ink or coating material to another.

When the inking/coating apparatus is used for applying an aqueous ink or an aqueous coating material, the water component on the freshly printed sheet S is evaporated by a high velocity, hot air interstation dryer and high volume heat and moisture extractor units 112 and 114, as shown in FIGURE 1, FIGURE 4 and FIGURE 5. The dryer/extractor units 112 and 114 are oriented to direct high velocity heated air onto the freshly printed/coated sheets as they are transferred by the interunit and the intermediate transfer cylinders 36, 40. By this arrangement, the freshly printed aqueous ink or coating material is completely dry before the sheet is overprinted in the next printing unit.

The high velocity, hot air dryer and high performance heat and moisture extractor units 112, 114 utilize high velocity air jets which scrub and break-up the moist air level which clings to the surface of each freshly printed sheet. Within each dryer, high velocity air is heated to a high temperature as it flows across a resistance heating element within an air delivery baffle tube. High velocity jets of hot air are discharged through

multiple airflow apertures through an exposure zone Z (FIGURE 4 and FIGURE 5) onto the freshly printed/coated sheet S as it is transferred by the transfer cylinder 36 and intermediate transfer cylinder 40, respectively. Each dryer assembly includes a pair of air delivery dryer heads which are arranged in spaced, side-by-side relation as shown in FIGURE 4 and FIGURE 5.

The high velocity, hot moisture-laden air displaced from each freshly printed sheet is extracted from the dryer exposure zone Z and completely exhausted from the printing unit by the high volume extractors. Each extractor head includes a manifold coupled to the dryer heads and draws the moisture, volatiles and high velocity hot air through a longitudinal gap between the dryer heads. According to this arrangement, each printed sheet is dried before it is run through the next printing unit.

The water-based inks used in flexographic printing dry at a relatively moderate drying temperature provided by the interstation high velocity hot air dryers/extractors 112, 114. Consequently, print quality is substantially improved since the aqueous ink is dried at each printing unit before it enters the next printing unit. Moreover, back-trapping on the blanket of the next printing unit is completely eliminated. This interstation drying arrangement makes it possible to print aqueous inks such as metallic ink and opaque white ink at one printing unit, and then overprint at the next printing unit.

This arrangement also permits the first printing unit to be used as a coater in which an aqueous coating is applied to low grade paper, for example recycled paper, to trap and seal in lint, dust, spray powder and other debris and provide a smoother, durable surface that can be overprinted in the next printing unit. The first down coating seals the surface of the low grade, rough substrate and improves overprinted dot definition while preventing strike-through and show-through. A UV-curable protective and/or decorative coating can be applied over the first down overprinted (aqueous) coating in the last printing unit.

Preferably, the applicator roller 66 is constructed of metal or ceramic when it is used for applying a coating material to the blanket B on the cylinder 34. When the applicator roller 66 is applied to the plate, it is preferably constructed as an anilox roller having a resilient transfer surface for engaging a flexographic printing plate. Suitable resilient roller surface materials include Buna N synthetic rubber and EPDM (terpolymer elastomer).

It will be appreciated that the inking/coating apparatus 10 is capable of applying a wide range of ink types, including fluorescent (Day Glo), pearlescent, metallics (gold, silver and other metallics), glitter, scratch and sniff (micro-encapsulated fragrance), scratch and reveal, luminous, pressure-sensitive adhesives and the like.

The press operator can eliminate the dampener roller assembly altogether, and the inking/coating apparatus 10 can selectively apply aqueous inks and coatings to a flexographic or waterless printing plate and the blanket. Moreover, overprinting of the aqueous inks and coatings can be carried out in the next printing unit since the aqueous inks and coatings are completely dried by the high velocity, hot air interstation dryer and high volume heat and moisture extractor assembly.

The aqueous inks and coatings as used in the present invention contain colored pigments and/or soluble dyes, binders that fix the pigments onto the surface of the printed sheet, and waxes, defoamers and thickeners. Aqueous printing inks predominantly contain water as a solvent, diluent and/or vehicle. The thickeners which are preferred include algonates, starch, cellulose and its derivatives, for example cellulose esters or cellulose ethers and the like. Coloring agents including organic as well as inorganic pigments may be derived from dyes which are insoluble in water. Also, the printing ink may contain water and can be predominantly glycol or the like, with the pigment being bound by an appropriate resin. When metallic inks are printed, the cells of the anilox roller must be appropriately sized to prevent the metal particles from getting stuck within the cells. The cell size is critical, and for metallic gold ink, the anilox roller should have a screen line count in the range of 175-300 lines per inch (69-118 lines per cm).

The inking/coating apparatus 10 can also apply UV-curable inks and coatings. If UV-curable inks and coatings are utilized, ultra-violet dryers/extractors are installed adjacent the high velocity hot air dryer/extractor units 112, 114, respectively.

It will be appreciated that the inking/coating apparatus 10 described herein makes it possible to selectively operate a printing unit in either the flexographic printing mode or the lithographic printing mode, while also providing the capability to print or coat from either the plate or blanket position. The dual cradle support arrangement of the present invention makes it possible to quickly change over from inking/coating at the blanket cylinder position to inking/coating at the plate cylinder position with minimum press down-time, since it is only necessary to remove and reposition or replace the applicator roller 66 while the printing/inking apparatus is in the retracted position.

Moreover, the press operator may elect to spot or overall coat with aqueous ink/coating from the plate during one job, and then spot and/or overall coat from the blanket during the next job. Since the doctor blade assembly can be flushed and washed-up quickly and the applicator roller can be replaced quickly, it is possible to spot coat or overall coat from the plate position or the blanket position with aqueous inks or coatings during the first press run and then spot coat or overall coat with UV-curable inks or coatings from the plate position or from

the blanket position during the next press run. The inking/coating apparatus 10 is completely out of the way in the retracted position; consequently, the doctor blade reservoir and supply lines can be flushed and washed-up by automatic wash-up equipment while the printing unit is printing another job.

The positioning of the applicator head and roller assembly relative to the plate and blanket is repeatable to a predetermined, preset impression position. Consequently, no printing unit adjustment or alteration is required, except for flushing the doctor blade assembly and cleaning or replacing the applicator roller to accommodate a different kind of ink or coating material. Although manual extension and retraction have been described in connection with the exemplary embodiment, extension to the operative position and retraction to a non-operative idle position can be carried out automatically by hydraulic or electric motor servomechanisms.

The Ferris wheel support arrangement allows the inking/coating apparatus to operate effectively in the interstation space between any adjacent printing units, as well as on the first or last printing units of the press, without blocking or obstructing the interstation space or restricting operator access to the cylinders of any of the printing units.

Finally, because the inking/coating apparatus of the present invention is mounted on a printing unit tower and is extendable to the operative position without

requiring adjustment or alteration of the printing unit cylinders, it can be used for applying printing ink or coating material to the blanket cylinder of a rotary offset web press, or to the blanket of a dedicated coating unit.

requiring adjustment or alteration of the printing unit cylinders, it can be used for applying printing ink or coating material to the blanket cylinder of a rotary offset web press, or to the blanket of a dedicated coating unit.

THE EMBODIMENT OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. Inking/coating apparatus for use in a printing press of the type having a printing unit on which a plate cylinder, a blanket cylinder and an impression cylinder are mounted for rotation, wherein the inking/coating apparatus is characterized by:

an applicator head for applying ink or coating material to a plate mounted on the plate cylinder or to a blanket mounted on the blanket cylinder, either separately or simultaneously when the inking/coating apparatus is in an operative position relative to the plate and blanket cylinders; and,

a carriage assembly for moving the applicator head to the operative position in which the applicator head is disposed laterally adjacent to the plate and blanket cylinders and for moving the applicator head from the operative position to a retracted position in which the applicator head is elevated with respect to the plate and blanket cylinders.

2. Inking/coating apparatus as set forth in claim 1, wherein the carriage assembly is characterized by:

a support arm having a first end portion constructed for pivotal attachment to the printing unit and having a second end portion pivotally coupled to the

applicator head, the applicator head being movable on the support arm to the operative position.

3. Inking/coating apparatus as set forth in claim 1, characterized in that a counterweight is coupled to the carriage assembly.

4. Inking/coating apparatus as set forth in claim 1, wherein the applicator head is characterized by:

a doctor blade assembly having a reservoir for receiving ink or liquid coating material; and,

an applicator roller coupled to the doctor blade assembly in fluid communication with the reservoir, the applicator roller being engagable with a printing plate on the plate cylinder or with a blanket on the blanket cylinder when the applicator head is in the operative position.

5. Inking/coating apparatus as set forth in claim 4, characterized in that the applicator roller is an anilox roller having a resilient transfer surface.

6. Inking/coating apparatus as set forth in claim 1, characterized in that:

a power actuator is movably coupled to the applicator head, the power actuator having a power transfer arm which is extendable and retractable; and,

movement converting apparatus is coupled to the power transfer arm for converting extension or retraction movement of the power transfer arm into pivotal movement of the applicator head relative to the carriage assembly.

7. Inking/coating apparatus as set forth in claim 6, wherein the movement converting apparatus is characterized by:

a bell crank plate having a first end portion coupled to the power transfer arm and having a second end portion for engaging a stop member;

a stop member secured to the applicator head; and,

a clevis plate secured to the carriage assembly and pivotally coupled to the bell crank plate.

8. Inking/coating apparatus as set forth in claim 1, wherein the applicator head is characterized by:

first and second side frame members pivotally coupled to the carriage assembly;

a doctor blade assembly mounted on the first and second side frame members, the doctor blade assembly including a reservoir for receiving ink or liquid coating material;

a cradle assembly mounted on the first and second side frame members, respectively;

an applicator roller mounted for rotation on the cradle assembly and coupled to the doctor blade assembly for rolling contact with ink or coating material in the reservoir, the applicator roller being engagable with a printing plate on the plate cylinder or with a blanket on the blanket cylinder when the applicator head is in the operative position; and,

a drive motor coupled to the applicator roller for rotating the applicator roller.

9. Inking/coating apparatus as set forth in claim 8, characterized in that:

the cradle assembly has first and second sockets disposed on the first and second side frame members respectively; and,

the applicator roller is mounted for rotation on the first and second sockets.

10. Inking/coating apparatus as set forth in claim 8, characterized in that

the cradle assembly includes first and second sockets disposed on the first and second side frame members, respectively, and third and fourth sockets disposed on the first and second side frame members, respectively; and,

the applicator roller is selectively mountable for rotation on either the first and second sockets or on the third and fourth sockets for applying ink

or coating material to either the plate or blanket when the applicator head is in the operative position.

11. Inking/coating apparatus as set forth in claim 1, wherein the applicator head is characterized by:

a first cradle for supporting an applicator roller for engagement with the plate when the inking/coating apparatus is in the operative position; and

a second cradle for supporting an applicator roller for engagement with the blanket when the inking/coating apparatus is in the operative position.

12. Inking/coating apparatus as set forth in claim 1, wherein the carriage assembly is characterized by:

a support arm having a first end portion pivotally coupled to the printing unit and having a second end portion;

a common pivot shaft on which the support arm second end portion and the inking/coating apparatus are pivotally mounted; and,

male and female latch members coupled between the common pivot shaft and the printing unit, with one of the latch members being secured to the common pivot shaft and the other latch member being constructed for attachment onto the printing unit, the latch members being mateable in interlocking engagement when the applicator head is in the operative position.

13. Inking/coating apparatus as set forth in claim 1, wherein the applicator head and the printing unit are characterized by:

male and female latch coupling members mounted on the carriage assembly and on the printing unit for releasably latching the carriage assembly in interlocking engagement with the printing unit when the applicator head is in the operative position.

14. Inking/coating apparatus as set forth in claim 1, wherein the carriage assembly is characterized by an elongated shank portion and a hub portion, the elongated shank portion being pivotally coupled to the applicator head and the hub portion being constructed for pivotal attachment onto the printing unit.

15. A rotary offset printing press having first and second printing units and the inking/coating apparatus of claim 1 is movably coupled to the first printing unit as set forth in claim 1, characterized by:

a dryer mounted on the first printing unit adjacent the impression cylinder of the first printing unit for discharging heated air onto a freshly printed substrate while the freshly printed substrate is in contact with said impression cylinder.

16. A rotary offset printing press as defined in claim 15, characterized in that:

an extractor is disposed adjacent the dryer for extracting hot air, moisture and volatiles from an exposure zone between the dryer and the freshly printed substrate.

17. A rotary offset printing press as defined in claim 15, characterized in that:

an intermediate transfer cylinder is coupled in sheet transfer relation with the impression cylinder of the first printing unit; and,

an interstation dryer is disposed adjacent the intermediate transfer cylinder for discharging heated air onto a freshly printed or coated substrate after it has been transferred from the impression cylinder of the first printing unit and while it is in contact with the intermediate transfer cylinder.

18. A method for rotary offset printing in a printing press of the type including first and second rotary offset printing units, and using aqueous or UV-curable printing ink or coating material in the operation of at least the first printing unit, characterized by the following steps performed at each printing unit in succession:

spot or overall coating the plate with aqueous ink/aqueous coating material or UV-curable ink/UV-curable coating material;

spot and/or overall coating the blanket with aqueous ink/aqueous coating material or UV-curable ink or UV-curable coating material;

transferring the printing ink or coating material from the printing plate to the blanket;

transferring the inked or coated image from the blanket to a substrate as the substrate is transferred through the nip between the impression cylinder and the blanket; and,

drying the ink or coating material on the freshly printed substrate before the substrate is subsequently processed.

19. A method for rotary offset printing as defined in claim 18, wherein the drying step is characterized by:

discharging high velocity, heated air onto the freshly printed/coated substrate while the freshly printed/coated substrate is in contact with the impression cylinder of the first printing unit.

20. A method for rotary offset printing as defined in claim 18, characterized by the steps:

transferring the freshly printed substrate from the first printing unit to an intermediate transfer cylinder; and,

drying the freshly printed substrate while it is in contact with the intermediate transfer cylinder.

21. A method for rotary offset printing as defined in claim 18, characterized by the step:

extracting hot air, moisture and volatiles from an exposure zone above the freshly printed/coated substrate while the freshly printed/coated substrate is in contact with the impression cylinder.

22. A method for rotary offset printing as defined in claim 18, characterized by the steps:

applying a primer coating of an aqueous coating material or UV-curable coating material to a substrate in the first printing unit; and,

drying the primer coating on the substrate before the substrate is processed in the second printing unit.

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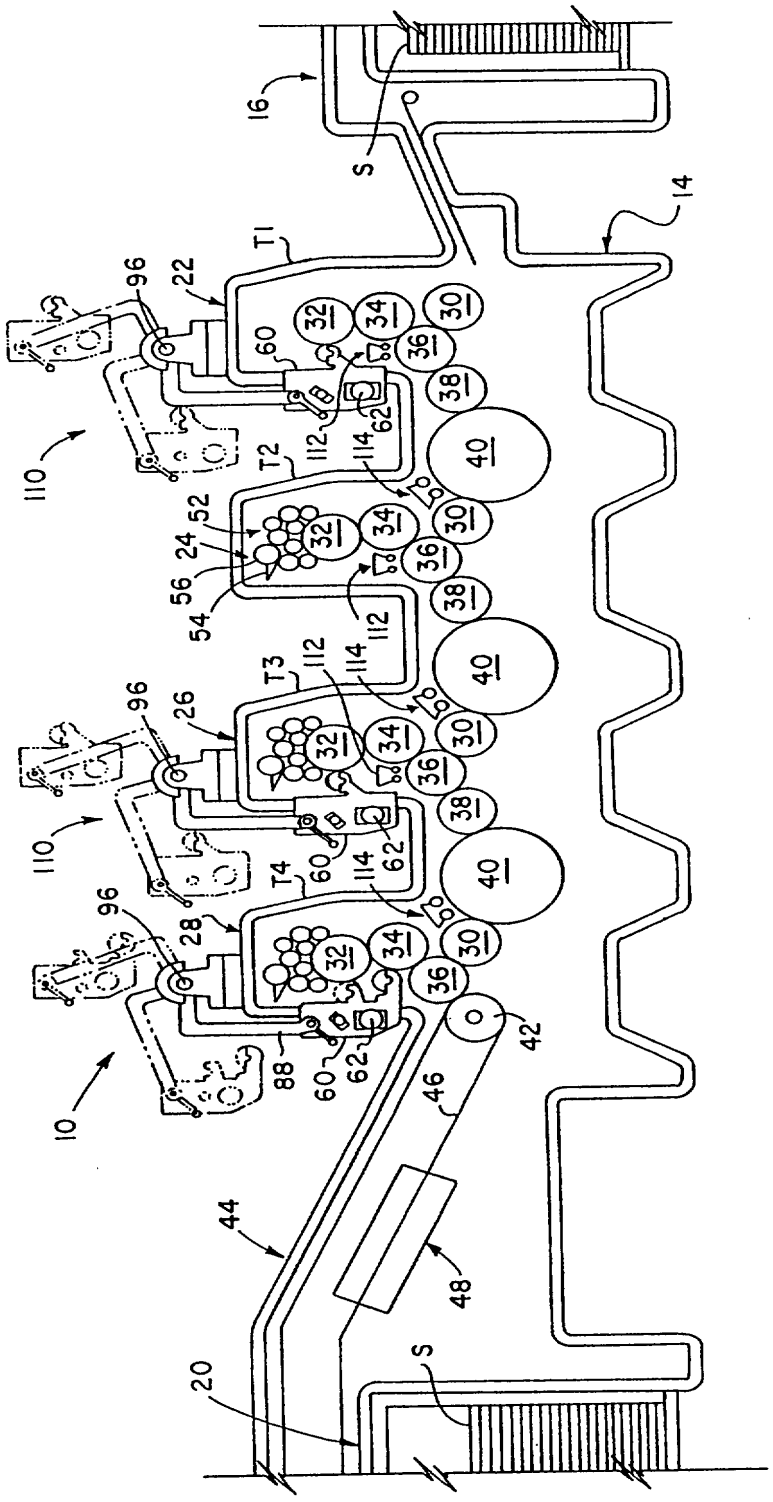

FIG. 1

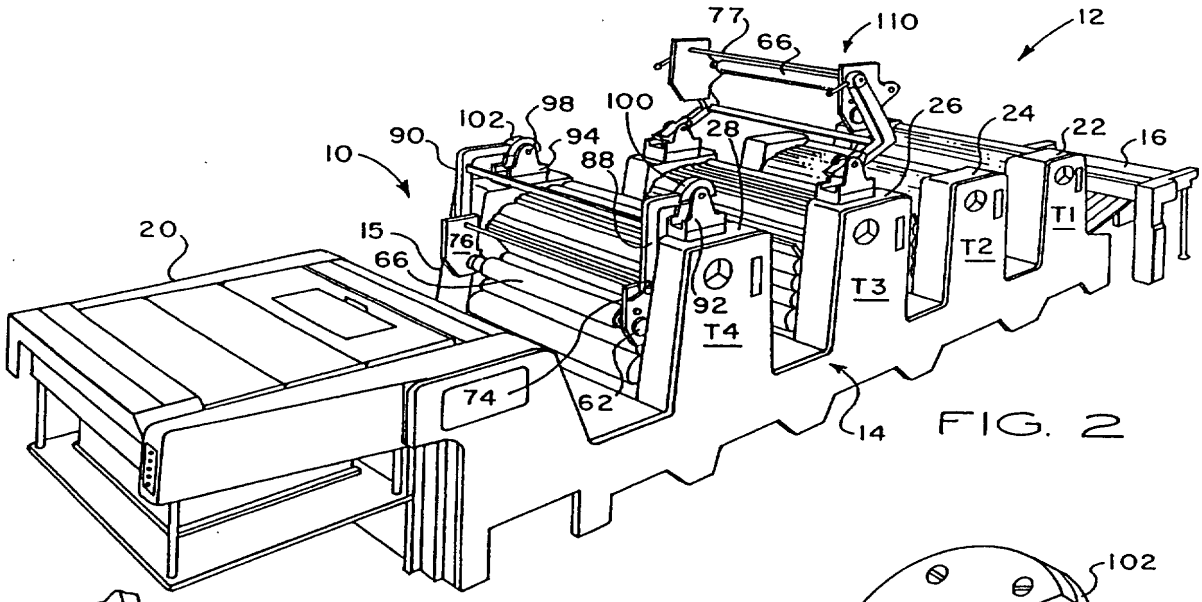
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FIG. 2

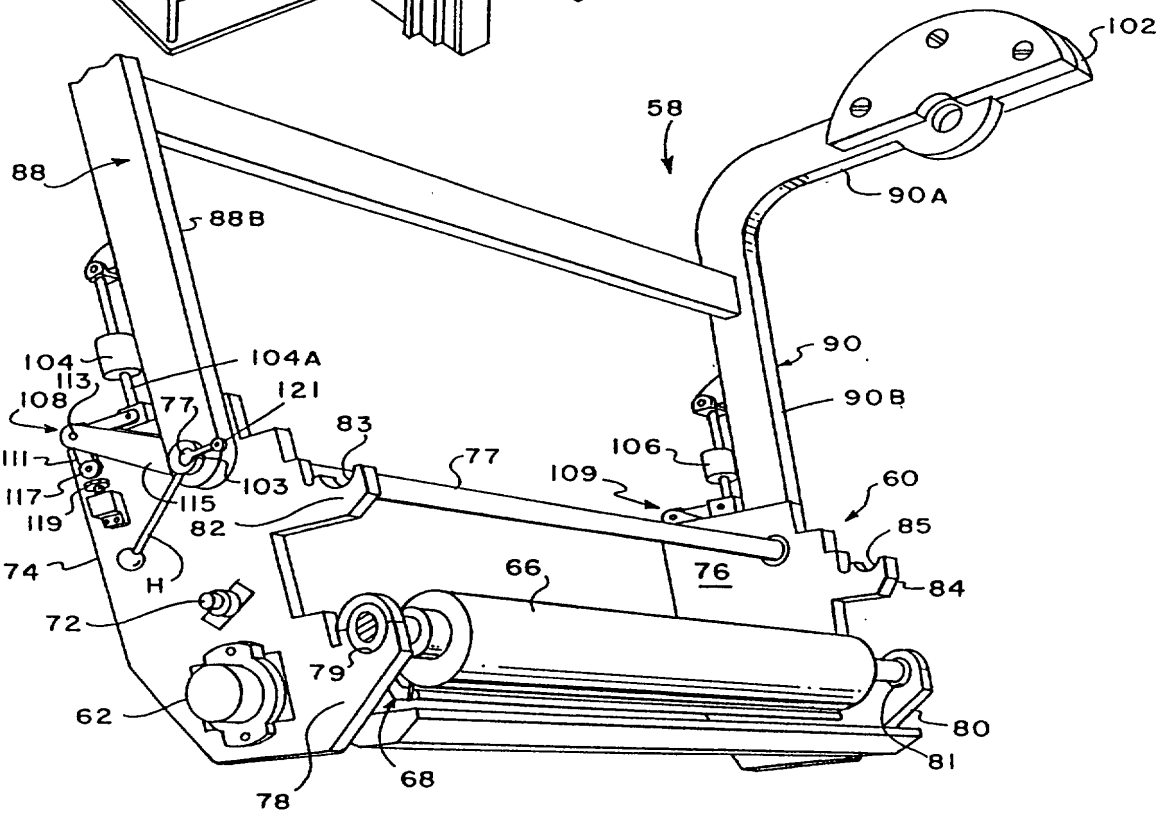
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FIG. 3

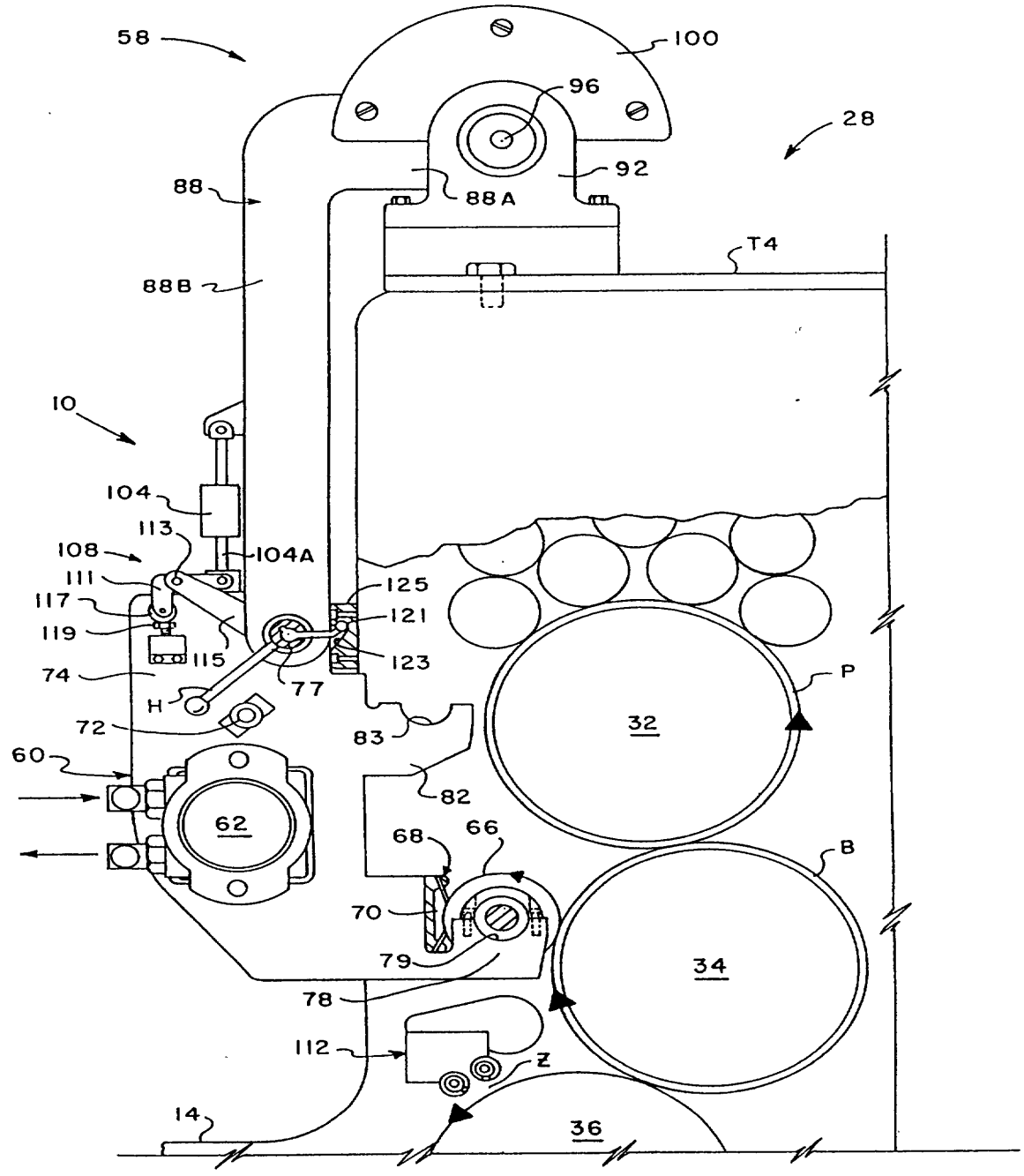
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FIG. 4

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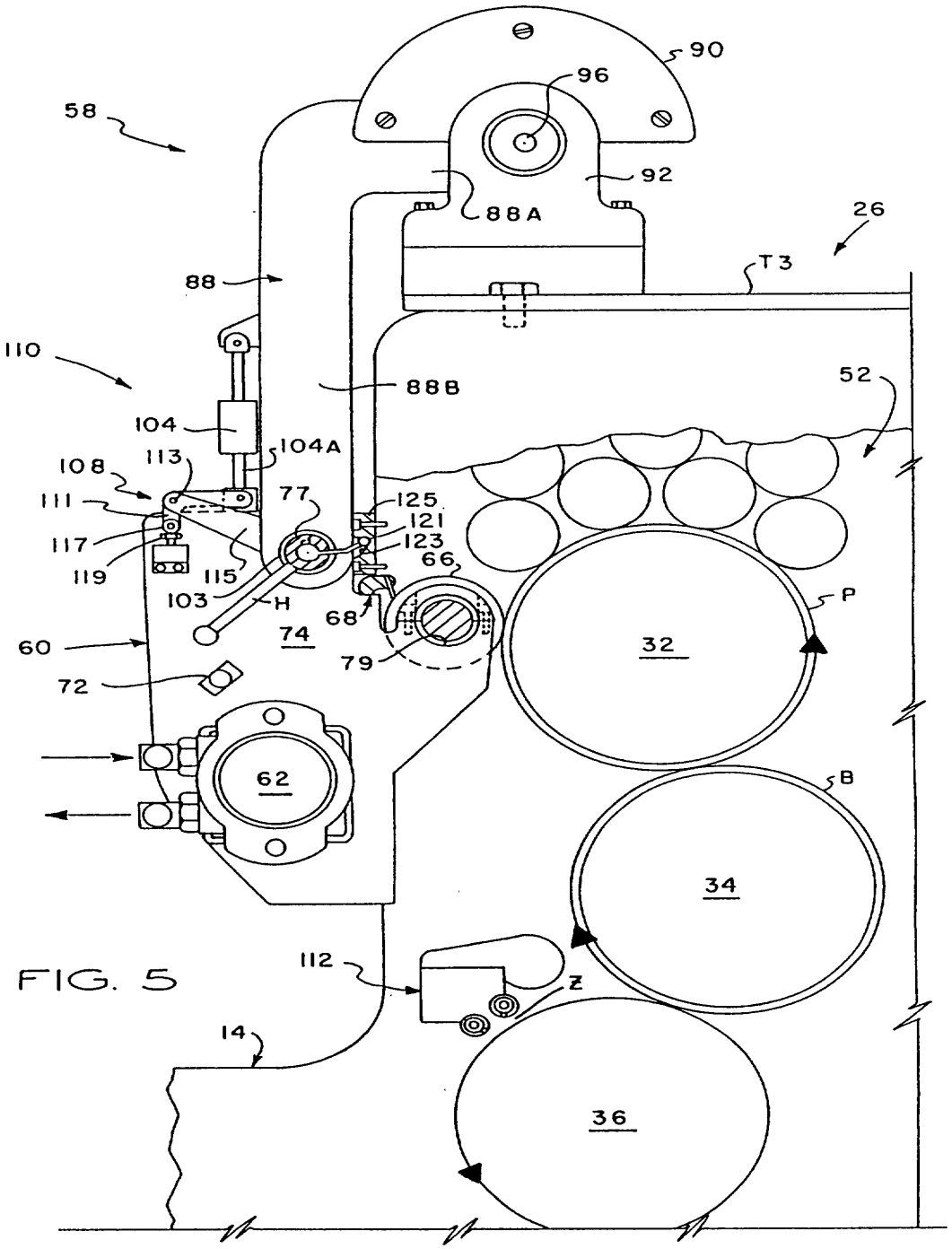

FIG. 5

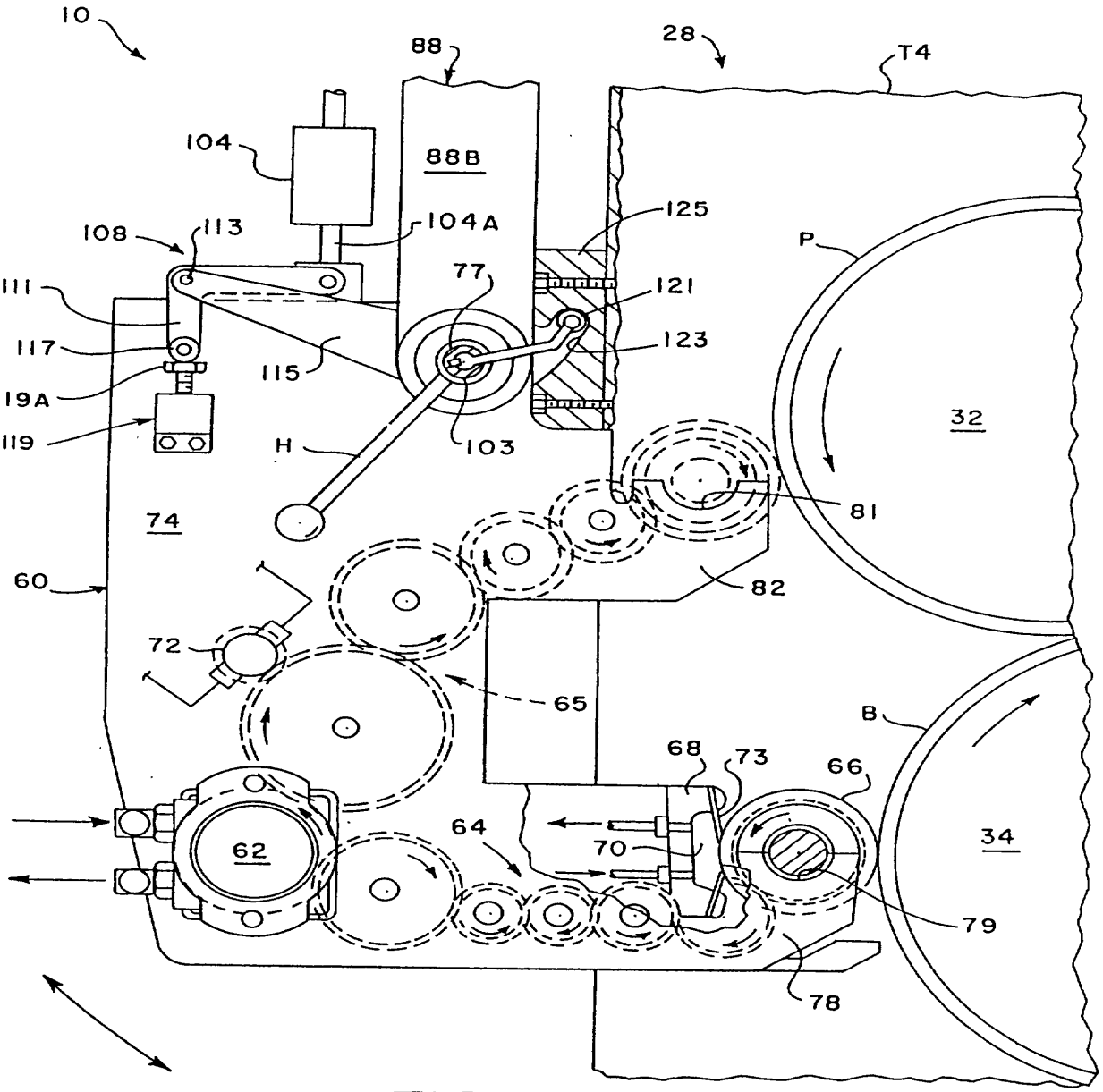
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FIG. 6

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June 19, 1996

Commissioner of Patents
1 Place du Portage
OTTAWA/HULL, Canada
K1A 0C9

ATTENTION: Patent Formalities Clerk

Dear Sirs:

Re: Canadian Patent Application 2,175,731
Applicant - H. W. DeMoore
Title - RETRACTABLE INKING/COATING APPARATUS HAVING FERRIS MOVEMENT BETWEEN PRINTING UNITS

This is responsive to your letter dated May 17, 1996, received in the abovenamed case.

Enclosed is an assignment (in duplicate) from R. M. Rendleman and J. W. Bird to H. W. DeMoore for filing in the abovenamed application. A cheque in the amount of $300.00 is enclosed to cover the completion fee and the fee for registering the assignment.

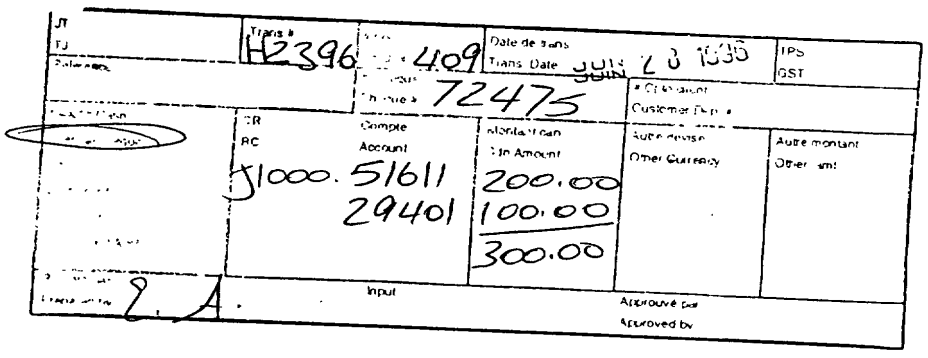
We look forward to receiving the registration details in due course.

Yours truly,

OGILVIE AND COMPANY

Per: E P Johnson

E. PETER JOHNSON
EPJ/DLM
Enclosures



OGILVIE, J H, QC (1893-1977)

Date	No.-No.
May 17, 1996	2,175,731
Applicant-Requérant HOWARD W. DeMOORE	
Your Reference-Votre Référence 7006.021	

Ogivie and Company
1400 Metropolitan Place
10303 Jasper Avenue
Edmonton, Alberta
T5J 3N6

Dear Sir/Madam:

Your application for Patent has been allotted the above mentioned serial number and the filing date of May 3, 1996.

However, this application is incomplete with regard to the following items:

1) Assignment

2) Completion fee as prescribed in Schedule II of the Patent Rules.

Your attention is directed to Section 30 of the Patent Act.

Yours truly,

Pepe Ali
Patent Formalities Clerk
(819) 953-8985
ym\m15

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Ottawa Hull K1A 0C9

Ogilvie & Company
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Edmonton, Alberta
T5J 3N6

Your File
7006.021

FILING CERTIFICATE

Patent File No: 2,175,731 **Filed:** 1996/05/03

Laid-Open Date: 1996/11/05

Priority Date : U.S.A. (08/435,798) 19950504

Invention : Retractable Inking/Coating Apparatus Having Ferris Movement Between Printing Units

Owner(s) : DeMoore, Howard W.

Inventor(s) : DeMoore, Howard W.; Rendleman, Ronald M.; Bird, John W.

Request for examination has been initiated

FOR 2175731 96/11/05

SPECIAL NOTICE

You are reminded that annual fees to maintain your application (or patent) are needed for each one-year period between the 1st and 19th anniversaries of the filing date. Failure to pay will lead to abandonment of your application (or lapsing of a patent).

A. McDonough

DIRECTOR
PATENT BRANCH

Ogilvie
AND COMPANY
BARRISTERS AND SOLICITORS
PATENT AND TRADE MARK AGENTS

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CALGARY, ALBERTA
T2P 2Y3
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TELEPHONE (403) 237-9050

May 2, 1996

Commissioner of Patents
1 Place du Portage
OTTAWA/HULL, Canada
K1A 0C9

Dear Sir:

Transmitted herewith for filing is the patent application of:

Applicant - Howard W. DeMoore

Inventors - Howard W. DeMoore, Ronald M. Rendleman and John W. Bird

Title - RETRACTABLE INKING/COATING APPARATUS HAVING FERRIS MOVEMENT BETWEEN PRINTING UNITS

Also enclosed is:

- a Petition - Claiming Priority of corresponding U.S. application and small entity status; and
- 5 sheets of formal drawings (in duplicate).

Claims as filed: Basic Fee - $150.00

Total claims - 22 Fee - ---
Independent claims - 2 Fee - ---

Total Filing fee - $150.00

Applicant respectfully requests examination of the application under subsection 35(1) of the Act.

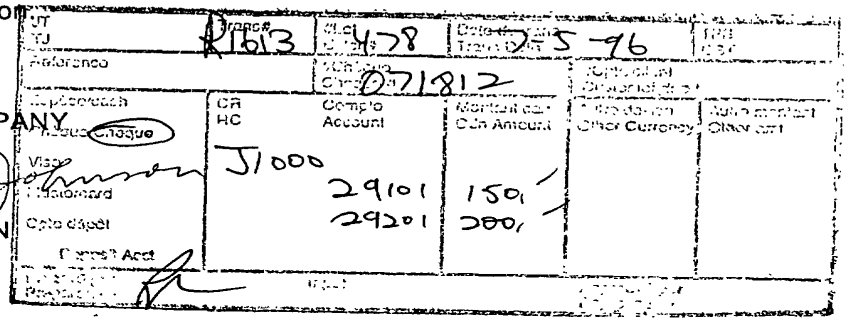
Also enclosed is a cheque in the amount of $350.00 to cover the filing fee and the fee for requesting examination.

Yours truly,

OGILVIE AND COMPANY

Per: EP Johnson

E. PETER JOHNSON
EPJ/DLM
Enclosures



THE EMBODIMENT OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. Inking/coating apparatus for use in a printing press of the type having a printing unit on which a plate cylinder, a blanket cylinder and an impression cylinder are mounted for rotation, wherein the inking/coating apparatus is characterized by:

an applicator head for applying ink or coating material to a plate mounted on the plate cylinder or to a blanket mounted on the blanket cylinder, either separately or simultaneously when the inking/coating apparatus is in an operative position relative to the plate and blanket cylinders; and,

a carriage assembly for moving the applicator head to the operative position in which the applicator head is disposed laterally adjacent to the plate and blanket cylinders and for moving the applicator head from the operative position to a retracted position in which the applicator head is elevated with respect to the plate and blanket cylinders.

2. Inking/coating apparatus as set forth in claim 1, wherein the carriage assembly is characterized by:

a support arm having a first end portion constructed for pivotal attachment to the printing unit and having a second end portion pivotally coupled to the

applicator head, the applicator head being movable on the support arm to the operative position.

3. Inking/coating apparatus as set forth in claim 1, characterized in that a counterweight is coupled to the carriage assembly.

4. Inking/coating apparatus as set forth in claim 1, wherein the applicator head is characterized by:

a doctor blade assembly having a reservoir for receiving ink or liquid coating material; and,

an applicator roller coupled to the doctor blade assembly in fluid communication with the reservoir, the applicator roller being engagable with a printing plate on the plate cylinder or with a blanket on the blanket cylinder when the applicator head is in the operative position.

5. Inking/coating apparatus as set forth in claim 4, characterized in that the applicator roller is an anilox roller having a resilient transfer surface.

6. Inking/coating apparatus as set forth in claim 1, characterized in that:

a power actuator is movably coupled to the applicator head, the power actuator having a power transfer arm which is extendable and retractable; and,

movement converting apparatus is coupled to the power transfer arm for converting extension or retraction movement of the power transfer arm into pivotal movement of the applicator head relative to the carriage assembly.

7. Inking/coating apparatus as set forth in claim 6, wherein the movement converting apparatus is characterized by:

a bell crank plate having a first end portion coupled to the power transfer arm and having a second end portion for engaging a stop member;

a stop member secured to the applicator head; and,

a clevis plate secured to the carriage assembly and pivotally coupled to the bell crank plate.

8. Inking/coating apparatus as set forth in claim 1, wherein the applicator head is characterized by:

first and second side frame members pivotally coupled to the carriage assembly;

a doctor blade assembly mounted on the first and second side frame members, the doctor blade assembly including a reservoir for receiving ink or liquid coating material;

a cradle assembly mounted on the first and second side frame members, respectively;

an applicator roller mounted for rotation on the cradle assembly and coupled to the doctor blade assembly for rolling contact with ink or coating material in the reservoir, the applicator roller being engagable with a printing plate on the plate cylinder or with a blanket on the blanket cylinder when the applicator head is in the operative position; and,

a drive motor coupled to the applicator roller for rotating the applicator roller.

9. Inking/coating apparatus as set forth in claim 8, characterized in that:

the cradle assembly has first and second sockets disposed on the first and second side frame members respectively; and,

the applicator roller is mounted for rotation on the first and second sockets.

10. Inking/coating apparatus as set forth in claim 8, characterized in that

the cradle assembly includes first and second sockets disposed on the first and second side frame members, respectively, and third and fourth sockets disposed on the first and second side frame members, respectively; and,

the applicator roller is selectively mountable for rotation on either the first and second sockets or on the third and fourth sockets for applying ink

or coating material to either the plate or blanket when the applicator head is in the operative position.

11. Inking/coating apparatus as set forth in claim 1, wherein the applicator head is characterized by:

a first cradle for supporting an applicator roller for engagement with the plate when the inking/coating apparatus is in the operative position; and

a second cradle for supporting an applicator roller for engagement with the blanket when the inking/coating apparatus is in the operative position.

12. Inking/coating apparatus as set forth in claim 1, wherein the carriage assembly is characterized by:

a support arm having a first end portion pivotally coupled to the printing unit and having a second end portion;

a common pivot shaft on which the support arm second end portion and the inking/coating apparatus are pivotally mounted; and,

male and female latch members coupled between the common pivot shaft and the printing unit, with one of the latch members being secured to the common pivot shaft and the other latch member being constructed for attachment onto the printing unit, the latch members being mateable in interlocking engagement when the applicator head is in the operative position.

13. Inking/coating apparatus as set forth in claim 1, wherein the applicator head and the printing unit are characterized by:

male and female latch coupling members mounted on the carriage assembly and on the printing unit for releasably latching the carriage assembly in interlocking engagement with the printing unit when the applicator head is in the operative position.

14. Inking/coating apparatus as set forth in claim 1, wherein the carriage assembly is characterized by an elongated shank portion and a hub portion, the elongated shank portion being pivotally coupled to the applicator head and the hub portion being constructed for pivotal attachment onto the printing unit.

15. A rotary offset printing press having first and second printing units and the inking/coating apparatus of claim 1 is movably coupled to the first printing unit as set forth in claim 1, characterized by:

a dryer mounted on the first printing unit adjacent the impression cylinder of the first printing unit for discharging heated air onto a freshly printed substrate while the freshly printed substrate is in contact with said impression cylinder.

16. A rotary offset printing press as defined in claim 15, characterized in that:

an extractor is disposed adjacent the dryer for extracting hot air, moisture and volatiles from an exposure zone between the dryer and the freshly printed substrate.

17. A rotary offset printing press as defined in claim 15, characterized in that:

an intermediate transfer cylinder is coupled in sheet transfer relation with the impression cylinder of the first printing unit; and,

an interstation dryer is disposed adjacent the intermediate transfer cylinder for discharging heated air onto a freshly printed or coated substrate after it has been transferred from the impression cylinder of the first printing unit and while it is in contact with the intermediate transfer cylinder.

18. A method for rotary offset printing in a printing press of the type including first and second rotary offset printing units, and using aqueous or UV-curable printing ink or coating material in the operation of at least the first printing unit, characterized by the following steps performed at each printing unit in succession:

spot or overall coating the plate with aqueous ink/aqueous coating material or UV-curable ink/UV-curable coating material;

spot and/or overall coating the blanket with aqueous ink/aqueous coating material or UV-curable ink or UV-curable coating material;

transferring the printing ink or coating material from the printing plate to the blanket;

transferring the inked or coated image from the blanket to a substrate as the substrate is transferred through the nip between the impression cylinder and the blanket; and,

drying the ink or coating material on the freshly printed substrate before the substrate is subsequently processed.

19. A method for rotary offset printing as defined in claim 18, wherein the drying step is characterized by:

discharging high velocity, heated air onto the freshly printed/coated substrate while the freshly printed/coated substrate is in contact with the impression cylinder of the first printing unit.

20. A method for rotary offset printing as defined in claim 18, characterized by the steps:

transferring the freshly printed substrate from the first printing unit to an intermediate transfer cylinder; and,

drying the freshly printed substrate while it is in contact with the intermediate transfer cylinder.

21. A method for rotary offset printing as defined in claim 18, characterized by the step:

extracting hot air, moisture and volatiles from an exposure zone above the freshly printed/coated substrate while the freshly printed/coated substrate is in contact with the impression cylinder.

22. A method for rotary offset printing as defined in claim 18, characterized by the steps:

applying a primer coating of an aqueous coating material or UV-curable coating material to a substrate in the first printing unit; and,

drying the primer coating on the substrate before the substrate is processed in the second printing unit.

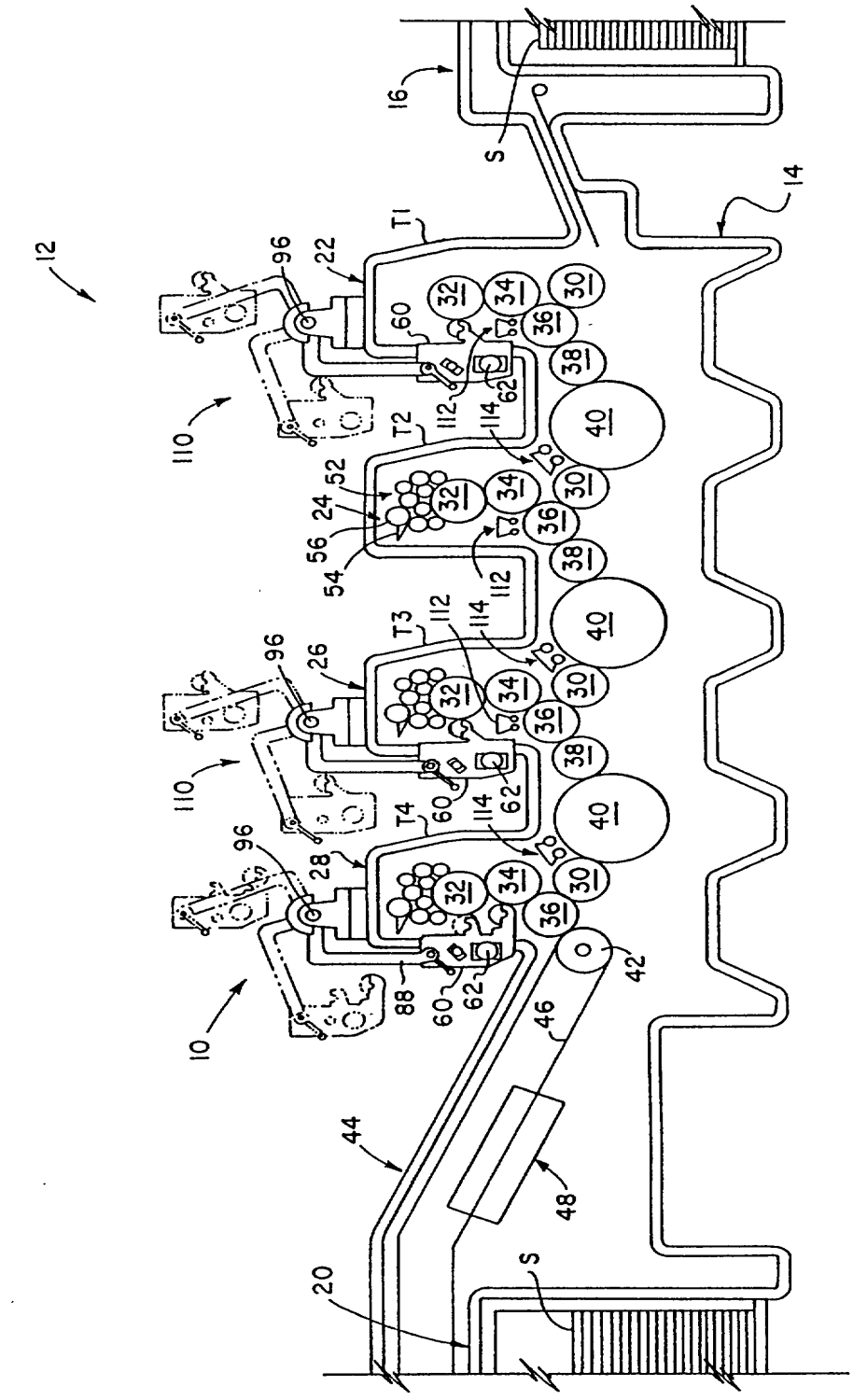

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FIG. 1

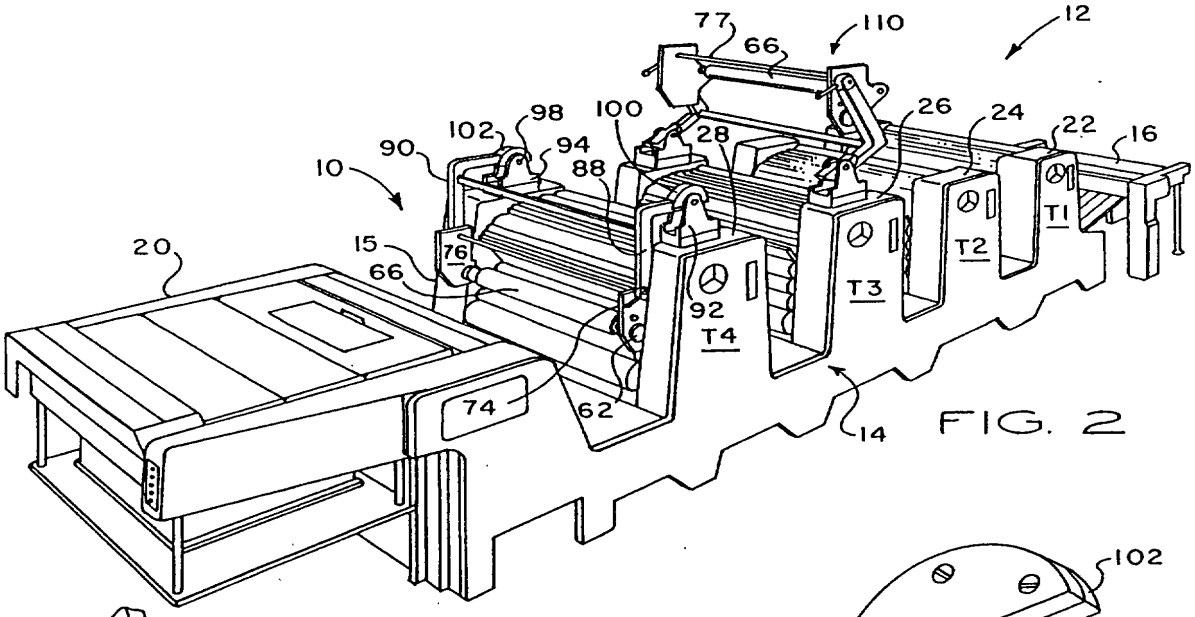
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FIG. 2

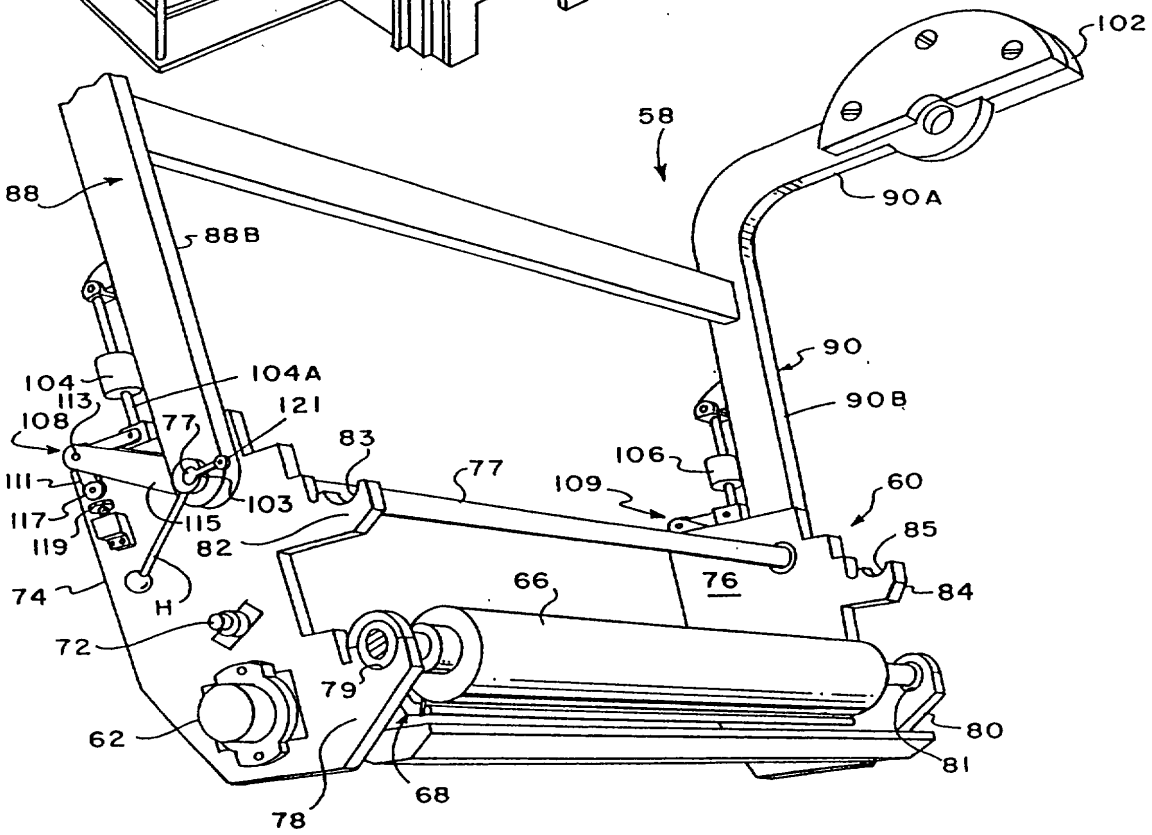
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FIG. 3

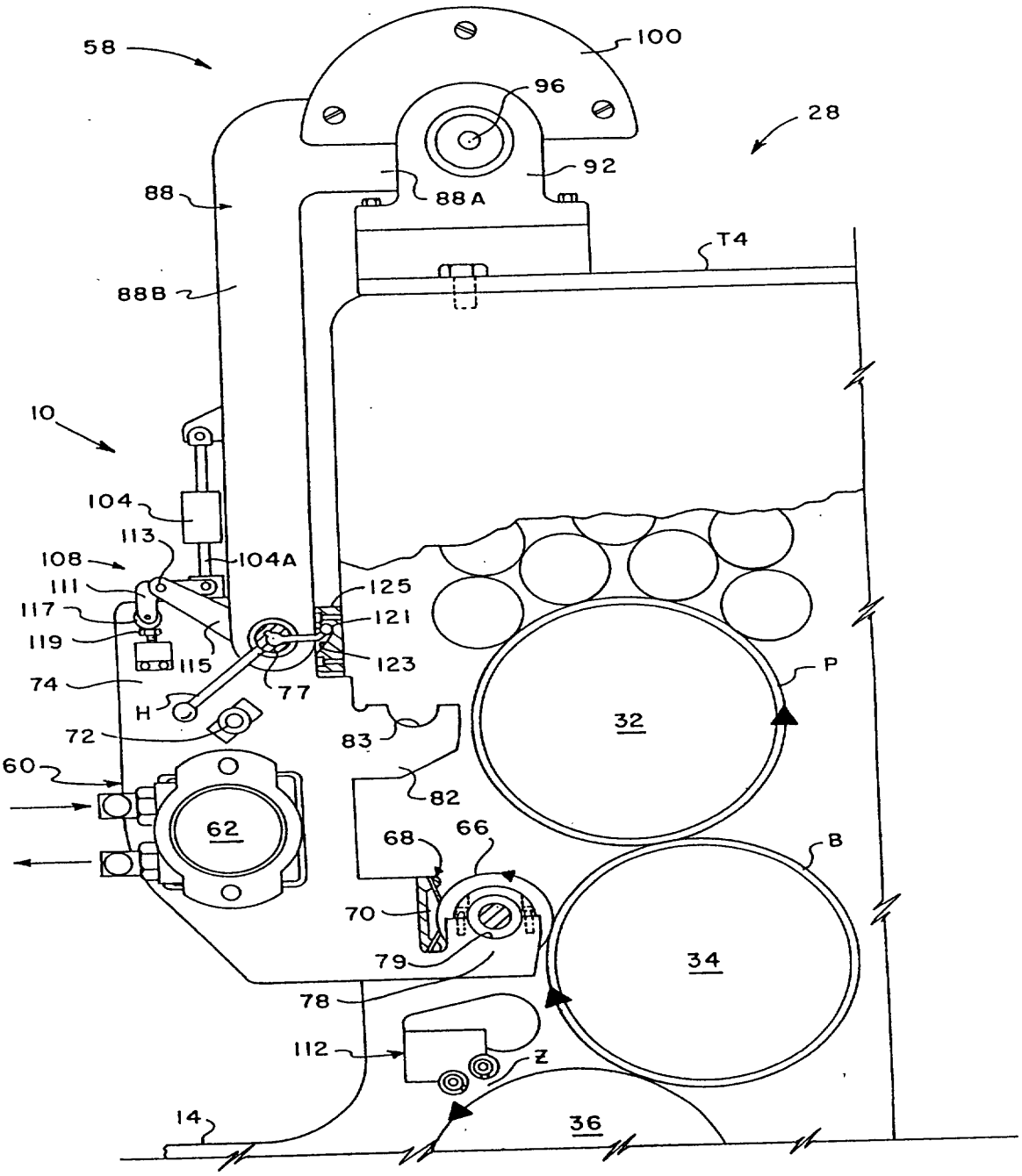
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FIG. 4

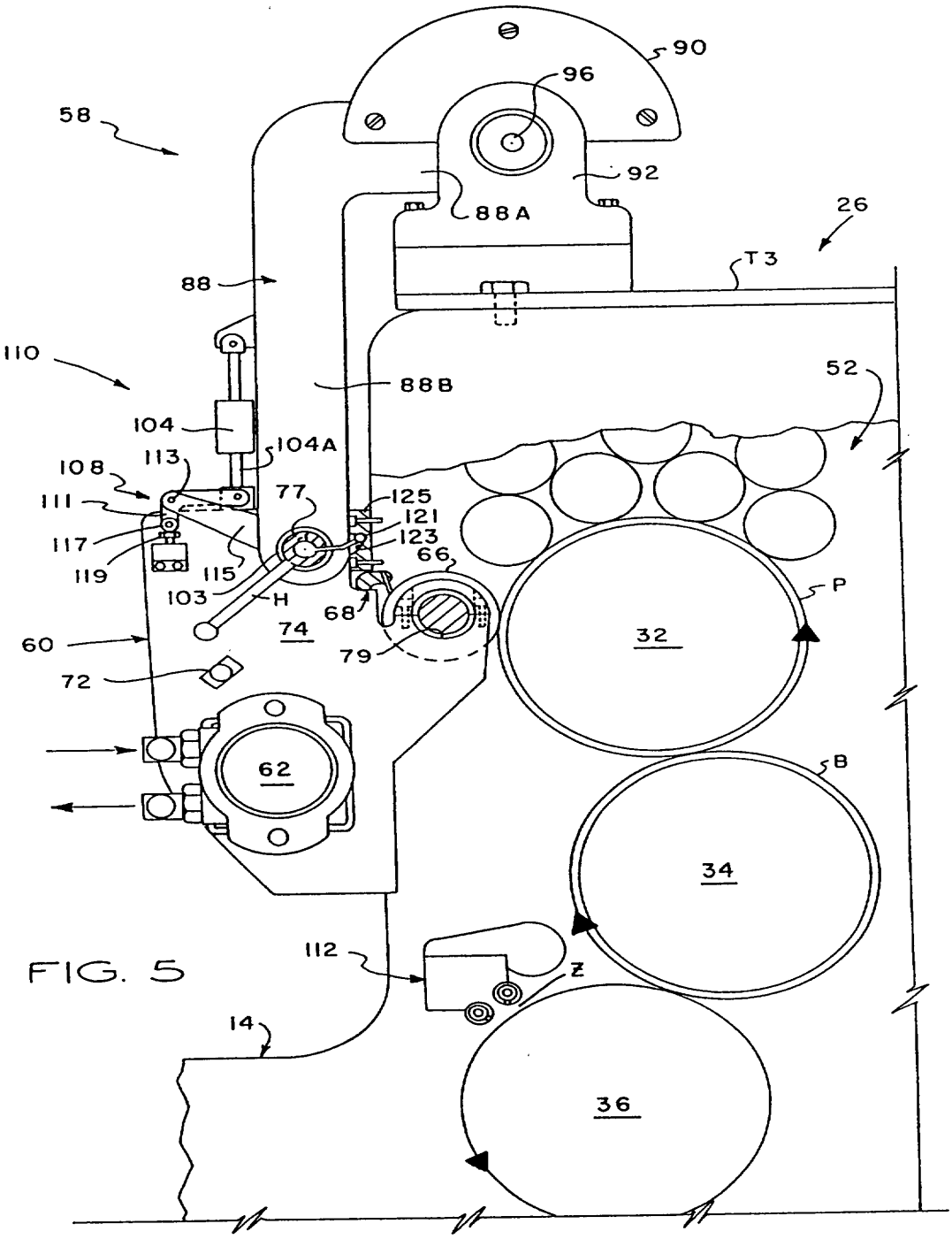
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FIG. 5

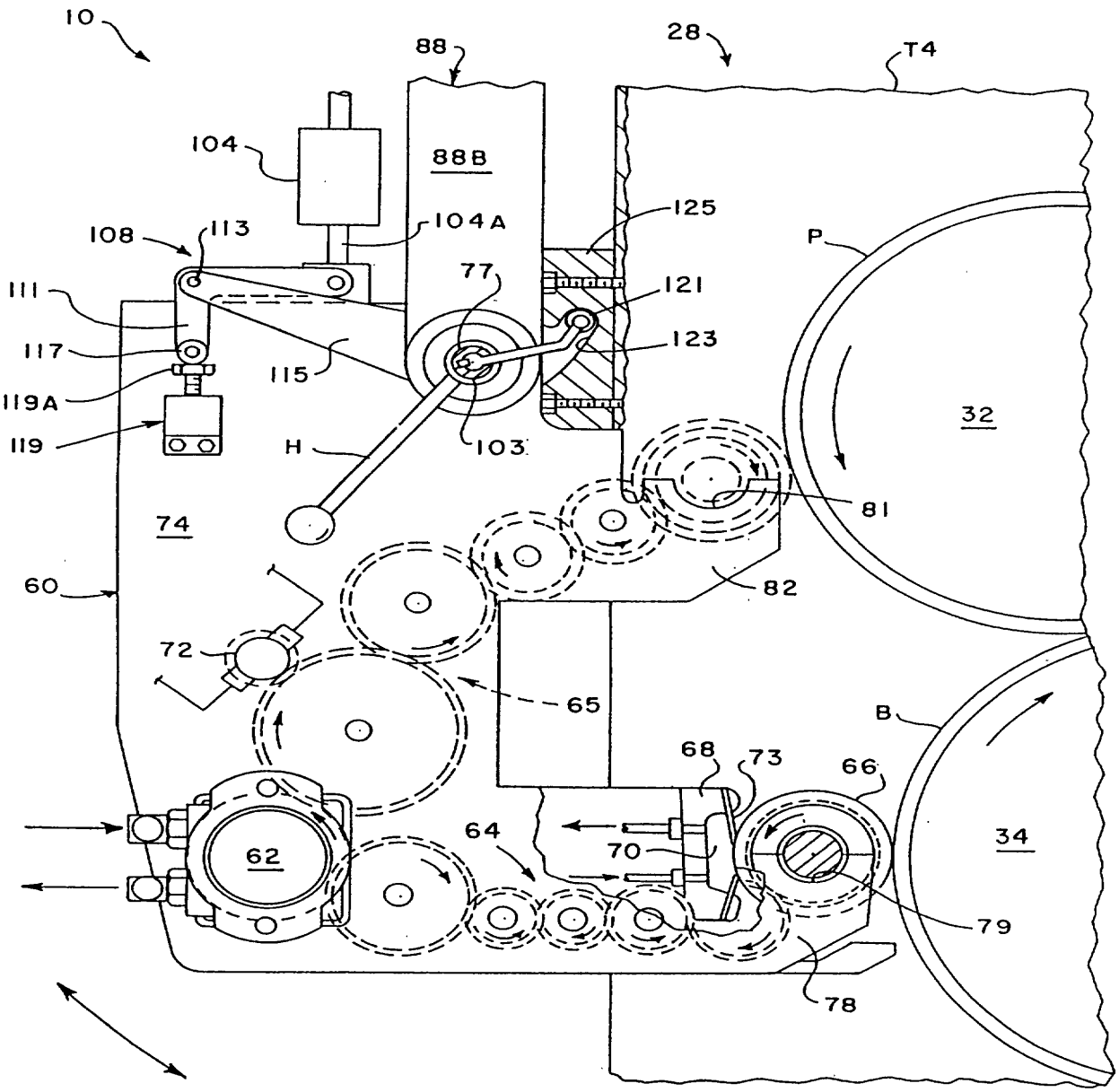
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FIG. 6

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Ogilvy & Company
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10303 Jasper Avenue,
Edmonton, Alberta
T5J 3N6

Registration Date

October 17, 1996

ENREGISTREMENT - REGISTRATION

1466123

Un document a été présenté au Commissaire aux brevets visant un (des) brevets(s) et/ou une (des) demande(s) de brevet pour fin d'enregistrement.

A document has been presented to the Commissioner of Patents for registration against a patent and/or an application for patent.

DEMANDES(S) - APPLICATIONS(S)

BREVET(S) - PATENT(S)

2175731

Guylaine Gauthier
Commis aux cessions de brevets - Patent Assignment Clerk

Industrie Canada Industry Canada

OPIC - CIPO 191

Canada

2175731

ASSIGNMENT

We, **RONALD M. RENDLEMAN** and **JOHN W. BIRD**, whose full post office address are (respectively) 4331 Royal Ridge, Dallas, Texas 75229, U.S.A. and 1514 Iroquois Circle, Carrollton, Texas 75007, U.S.A., for good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, do hereby assign to **HOWARD W. DEMOORE**, whose full post office address is 10954 Shady Trail, Dallas, Texas, 75230, U.S.A., all our interest in Canada in and to an invention relating to a RETRACTABLE INKING/COATING APPARATUS HAVING FERRIS MOVEMENT BETWEEN PRINTING UNITS, as fully described and claimed in an application for a patent for such invention, and to all our corresponding right, title and interest in and to any patent which may issue therefor.

SIGNED AT DALLAS, TEXAS, this 20th day of May, 1996.

Ronald M. Rendleman
RONALD M. RENDLEMAN

Audra Willis
WITNESS

SIGNED AT CARROLLTON, TEXAS, this 20th day of May, 1996.

John W. Bird
JOHN W. BIRD

Audra Willis
WITNESS

CERTIFICATE OF WITNESS

I acknowledge that I was personally present and did see RONALD M. RENDLEMAN, who is personally known to me, duly execute the above assignment on the date therein set forth.

Signature of Witness *Audra Willis*

Name of Witness Audra Willis

Address of Witness 8555 Fair Oaks Crossing #503, Dallas TX 75243

CERTIFICATE OF WITNESS

I acknowledge that I was personally present and did see JOHN W. BIRD, who is personally known to me, duly execute the above assignment on the date therein set forth.

Signature of Witness *Audra Willis*

Name of Witness Audra Willis

Address of Witness 8555 Fair Oaks Crossing #503, Dallas TX 75243

FEE - TAXE	NO. - N°	REGISTRATIONS - ENREGISTREMENTS
100	146673	APPLICANT-DEMANDEUR

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REPRESENTATIVE - REPRÉSENTANT

APPOINTMENT OF AGENT - NOMINATION D'AGENT

ASSOCIATE AGENT - AGENT ASSOCIÉ

ABSTRACT - PRÉCIS

SPECIFICATION - MÉMOIRE DESCRIPTIF

2nd CLAIM - 2ième REVENDICATION

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ORIGINAL PATENT - BREVET ORIGINAL

LETTERS OF ADMINISTRATION - LETTRES D'ADMINISTRATION

ASSIGNMENT - CESSION

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MAY 17 1996 [illegible]

June 26/96 Let. accept $300.

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⑲日本国特許庁(JP)　⑪特許出願公開

⑫公開特許公報(A)　昭63－62733

⑤1Int.Cl.⁴　識別記号　庁内整理番号　⑬公開　昭和63年(1988)3月19日
B 41 F 31/00　6763－2C

審査請求　有　発明の数 1　(全3頁)

⑤4発明の名称　枚葉輪転機の切替え可能なインキ装置

⑳特　願　昭62－211528
㉒出　願　昭62(1987)8月27日
優先権主張　㉜1986年8月27日㉝西ドイツ(DE)㉛P3629081.5

⑦2発明者　クラウス・ジーメート　ドイツ連邦共和国オツフエンバツハ・マイン・ゲシユヴイスターーシヨルーシユトラーセ　15－17
⑦1出願人　エム・アー・エヌーローラント・ドルツクマシーネン・アクチエンゲゼルシヤフト　ドイツ連邦共和国オツフエンバツハ・アム・マイン・クリスチアンープレスーシユトラーセ　6－30
⑦4代理人　弁理士　矢野　敏雄　外1名

明　細　書

1　発明の名称

枚葉輪転機の切替え可能なインキ装置

2　特許請求の範囲

枚葉輪転機の切替え可能なインキ装置であつて、常時接触するインキ着けローラ並びに中間ローラの一群がインキ供給機構と版面との間に配置されており、印刷の停止に伴いこれらのローラ群へのインキ供給も版面へのインキ放出も中断可能であり、インキの中継および分配のために協働するインキ着けローラおよび中間ローラの数を選択的に多くするか又は少なくするように少なくとも1つの中間ローラが手動又は機械式に切替え可能である形式のものにおいて、インキ着けローラ(4，5，6)と協働する1つの中間ローラ(13)に付加的なインキ供給機構(17)が係合兼しや断可能であり、主インキ装置運転中付加的なインキ供給機構(17)のしや断状態で協働するローラ(6，12；9，13)が、付加的なインキ供給機構(17)の係合状態での短縮インキ装置運転中互いに分離可能であることを特徴とする、枚葉輪転機の切替え可能なインキ装置

3　発明の詳細な説明

産業上の利用分野

本発明は、枚葉輪転機の切替え可能なインキ装置であつて、常時接触するインキ着けローラ並びに中間ローラの一群がインキ供給機構と版面との間に配置されており、印刷の停止に伴いこれらのローラ群へのインキ供給も版面へのインキ放出も中断され、インキの中継および分配のために協働するインキ着けローラおよび中間ローラの数を選択的に多くするか又は少なくするように少なくとも1つの中間ローラが手動又は機械式に切替え可能である形式のものに関する。

従来の技術

この種の切替え可能なインキ装置は既に公知であつて、例えば西独特許出願公告第1234739号明細書の冒頭に述べられている。

この公知の切替え可能なインキ装置の難点は次の点にある。すなわち、インキ着けローラへ最短距離で最少限の中間ローラ、ひいては最少限のインキ分割によつてインキを供給することが不可能であるという点である。この場合常にインキ形成ローラよりも多くの中間ローラがインキ分割に供用されたままである。インキ着けローラは周知の通りインキ形成ローラとして数えることはできない。というのは、たんに中間ローラから受け取つたインキ膜を版面へ放出するだけだからである。例えば、見当合わせ又はその他の調整等のために、ほとんどインキを必要としないか又は校正刷り用のわずかな枚葉紙しか必要としないような場合、公知の切替え可能なインキ装置はそのインキ形成ラインが長過ぎるために応動が遅過ぎ、所要のインキと水とのバランス、要するに正しいインキ・水エマルジョンを得ることができないか或いは少なくとも早期に得ることができない。

本発明が解決しようとする課題

本発明の課題は、このような公知の切替え可能なインキ装置の場合に本刷りの間並びに本刷りの中断時に発生する中間ローラのインキのバランス状態もしくはインキ層厚減少の支障を、切替え操作、それも主インキ装置運転以外に校正刷り並びに最小インキ消費のための短縮インキ装置運転をも可能にする切替え操作によつて回避することである。

課題を解決するための手段

本発明はこのような課題を次のようにして解決した。すなわち、インキ着けローラと協働する1つの中間ローラに付加的なインキ供給機構が係合兼しや断可能であり、主インキ装置運転中に付加的なインキ供給機構がしや断された状態で協働するローラが、短インキ装置運転中に付加的なインキ供給機構が接続された状態で互いに分離可能であるように構成したのである。

実施例

次に図面に示した実施例に従つて本発明を説明する：

第1のインキ供給機構、例えばインキ出しローラ1と揺動するインキ移しローラ2並びに版胴3上の版面との間に、主インキ装置運転中に協働するインキ着けローラ4，5，6，7と中間ローラ8，9，10，11，12，13，14，15，16とから成るローラ群が配置されている。この場合、中間ローラ11～15はインキならしローラとして、また中間ローラ16は内側のインキ着けローラ5，6の間へ上から係合する接続ローラとしてそれぞれ構成されている。

印刷の停止の際にインキ供給を中断するためにインキ着けローラ4～7の作用を解除する制御可能な解除機構は一般に周知であるため図示してない。主インキ装置運転中に協働するローラ9，13；6，12の分離操作と短縮インキ装置運転のためのローラ群4，5，6，13，16の形成とにとつて必要な調整機構、例えば偏心軸受、空圧シリンダ、旋回レバーその他もやはり一般に周知である。従つて、相応の切替え操作は図中で切替え可能な中間ローラ9およびインキ着けローラ6の鎖線図示によつて概略的に示すにとどめた。

短縮インキ装置運転時のローラ群として協働するローラ4，5，6，13，16を、例えば版胴2の中心軸線を中心として旋回可能であるか又は印刷装置内で下降可能である1つのインキ装置フレーム内に配置して、このインキ装置フレームを切り替えることも可能であり、かつ公知である。

同じことが付加的なインキ供給機構17についてもいえる。このインキ供給機構17は例えば下降可能又は旋回可能に印刷装置内に配置されていて、迅速に応動するインキ装置として1つの調量ローラ18と2つの中間ローラ19，20と1つの自動調整式のインキ供給源21とから成つている。

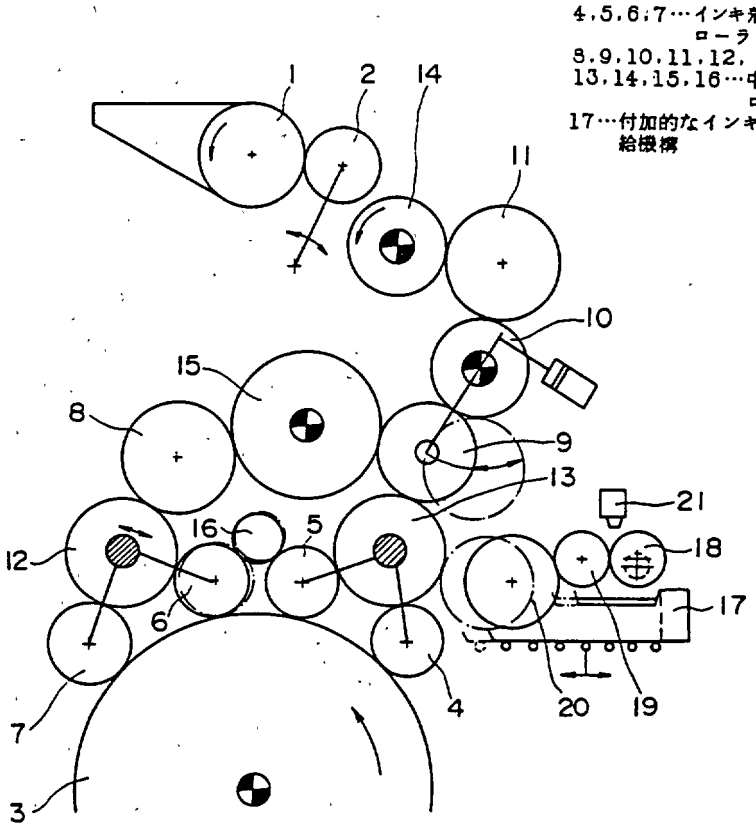
このように切り離された迅速応動式の短縮インキ装置4，5，6，13，16，17，18～21においては直ちにインキ・水バランスが得

られる。従つて試し刷り用並びにわずかなインキ消費用として特に適している。ローラ群4，5，6，13，16を短縮インキ装置運転から主インキ装置運転への切替えを付加的なインキ供給機構17のしや断とにより本刷り用の平常のインキ装置状態へ移行することができ、要するに平常のインキ消費から最大のインキ消費のインキ装置状態へ移行することができる。事実上インキを必要としない場合には主インキ装置運転へ切替えなくてよく、たんに短縮インキ装置4，5，6，13，16，17～21のみで作業が行なわれる。

主インキ装置運転中本刷りの中断に伴つて生ずるインキ・水バランス状態もしくは中間ローラ8～15のインキ層厚減少の支障を避けるために、公知の制御可能な機構によつて短縮インキ装置運転への切替えを印刷停止に連動させることもできる。

4　図面の簡単な説明

図面は本発明の実施例を示す概略図である。



1…インキ出しローラ、2…インキ移しローラ、3…版胴、4，5，6，7…インキ着けローラ、8，9，10，11，12，13，14，15，16…中間ローラ、17…付加的なインキ供給機構、18…調量ローラ、19，20…中間ローラ、21…自動調整式インキ供給源

代　理　人　弁理士　矢　野　敏　雄

11

United States Patent [19]

Simeth

[11] **Patent Number: 4,882,991**

[45] **Date of Patent: Nov. 28, 1989**

4

[54] **CHANGE-OVER INKING UNIT OF A SHEET-FED ROTARY PRESS**

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[21] Appl. No.: **296,356**

[22] Filed: **Jan. 10, 1989**

Related U.S. Application Data

[63] Continuation of Ser. No. 90,117, Aug. 27, 1987, abandoned.

[30] **Foreign Application Priority Data**

Aug. 27, 1986 [DE] Fed. Rep. of Germany 3629081

[51] **Int. Cl.**[4] **B41F 31/10**; B41F 31/30

[52] **U.S. Cl.** **101/350**; 101/352

[58] **Field of Search** 101/349, 351, 352, 350, 101/148, 363, 207, 208-210

[56] **References Cited**

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Primary Examiner—J. Reed Fisher

Attorney, Agent, or Firm—Leydig, Voit & Mayer

[57] **ABSTRACT**

A sheet feed rotary press having a main ink feed unit and a plate cylinder, at least one of a plurality of transfer and applicator rolls coupled between the main ink feed unit and the plate cylinder being moveable to an inoperative position for selectively isolating a relatively short length group of applicator and transfer rolls from the main ink feed unit, and an additional quick acting ink feed unit that is selectively moveable into engagement with the short length roll group for supplying lesser quantities of ink to the plate cylinder through a shortened path via the short length roll group.

5 Claims, 1 Drawing Sheet

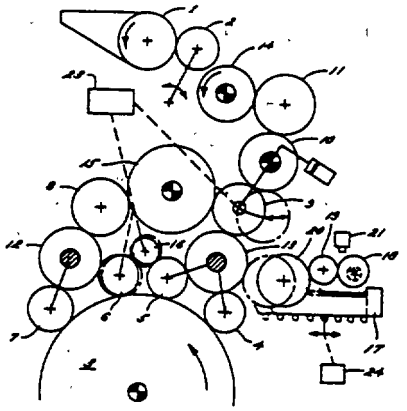
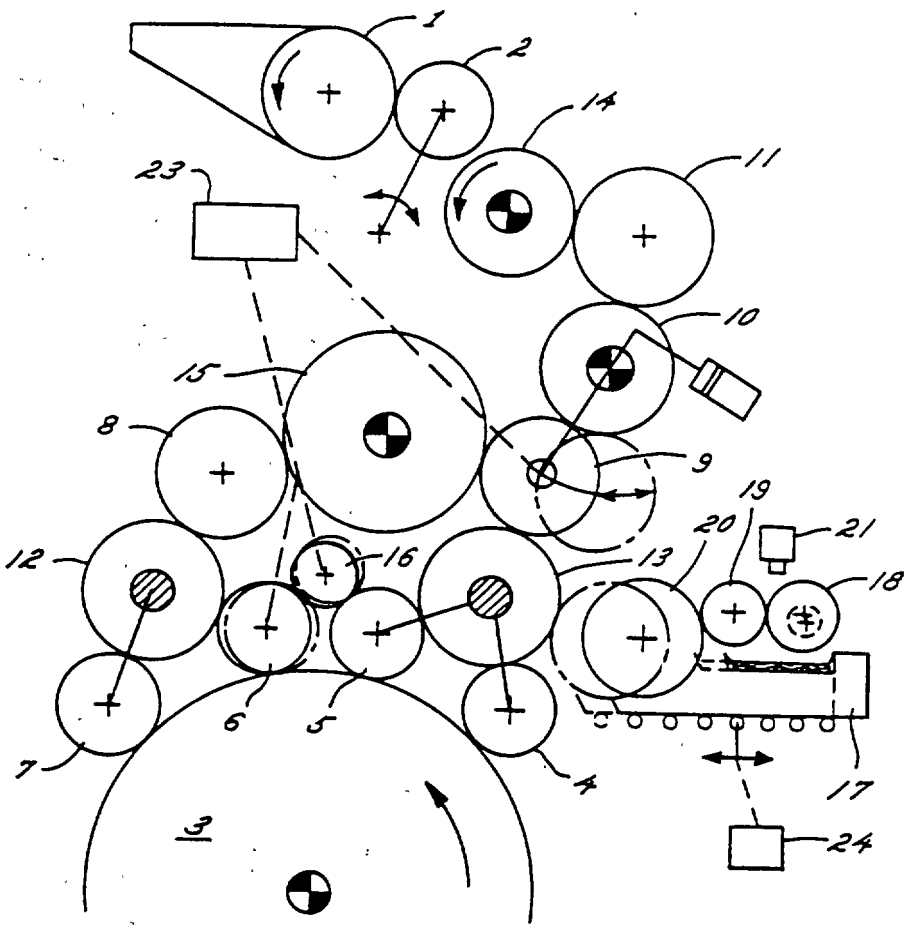


FIG. 1



CHANGE-OVER INKING UNIT OF A SHEET-FED ROTARY PRESS

This application is a continuation of application Ser. No. 090,117, filed Aug. 27, 1987, now abandoned.

The present invention relates to change over inking units for sheet feed rotary presses.

Devices of this kind are known, as described in the introductory portion of German patent AS 1 234 739. A disadvantage of these known devices is that upon the interruption or completion of a printing operation they are not adapted to quickly supply small amounts of ink to a relatively few sheets, as commonly required for proof situations, for example, to assess register or control adjustments or the like. Known change over ink units react relatively slowly, requiring the ink passage through a long line of transfer rolls to build up the requisite ink-water equilibrium and to establish the desired layer density for transfer to the plate cylinder.

It is an object of the present invention to provide a change over inking system adapted to obviate disturbances of the ink-water equilibrium or ink layer density in the ink transfer rolls, as commonly occurs in the known change over inking units during run-on following completion or interruption of a printing operation.

Another object to provide a change over inking system as characterized above that includes a more quickly responsive short length inking unit that can be used for proof situations and minimum ink consumption printing when the main inking unit of the press is not operating or is unneeded.

Other objects and advantages of the invention will become apparent upon reading the following detailed description and upon reference to the drawings, in which:

FIG. 1 is a diagrammatic illustration of an illustrative sheet fed rotary printing press having a change over inking unit embodying the present invention.

While the invention is susceptible of various modifications and alternative constructions, a certain illustrated embodiment thereof has been shown in the drawings and will be described below in detail. It should be understood, however, that there is no intention to limit the invention to the specific form disclosed, but on the contrary, the intention is to cover all modifications, alternative constructions and equivalents falling within the spirit and scope of the invention.

Referring now more particularly to the drawings, there is shown an illustrative sheet fed rotary printing press embodying the invention. The printing press includes a plurality of applicator rolls 4–7 and plurality of transfer rolls 8–16 which are interposed between a first or main ink feeder, for example, a duct roll 1 and a vibrator roll 2, and the printing forme, for example, on a plate cylinder 3. During normal printing operations, when normal to maximum ink consumption is required, ink is transferred from the duct roll 1 and vibrator roll 2, through the transfer rolls 14, 11 and 10 to the transfer roll 9. From the transfer roll 9, ink is transferred through the transfer roll 13 to the applicator rolls 4 and 5 and also through the transfer rolls 15, 8 and 12 to the applicator rolls 5 and 6. The transfer roll 16 in this case is a connecting roll between applicator rolls 5 and 6. As is known in the art, such ink transfer smooths the ink to the desired density for transfer to the applicator rolls and printing form.

Selected groups of the transfer and applicator rolls preferably remain permanently engaged at all times. In this instance, transfer rolls 14, 11 and 10 are permanently engaged, transfer rolls 15, 18 and 12 are permanently engaged with applicator roll 7, and transfer rolls 13, 16 and applicator rolls 4, 5, and 6 remain engaged at all times.

Selectively operable means are provided for interrupting the flow of ink to the applicator rolls 4–7 from the main inking unit 1, 2 upon cessation or completion of the printing operation. In this instance, means, diagrammatically indicated at 23, are provided for moving the transfer roll 9 to an inoperative position disengaged from transfer rolls 15 and 13, as shown in phantom, and for moving the transfer roll 16 and applicator roll 6 out of engagement with transfer roll 12, while they respectively maintain contact with the cylinder roll 3 and applicator roll 5, again as shown in phantom. It will be appreciated that such moving means may be of a known type, such as eccentric mountings for the movable rolls, pneumatic cylinders, pivoted levers or the like, which are effective to separate transfer rolls 9 and 13 and rolls 12 and 6 to in effect isolate a relatively short length roll group 4–6, 13 and 16 from the main ink feeder. It will be understood that the rolls 4–6, 13 and 16 which form the short length inking roll group could be mounted in an inking unit frame, which, for example, could be pivoted about a central axis for the plate cylinder 3 or otherwise be moved as a unit during a change over operation.

In accordance with the invention, additional ink feeding means is provided which is selectively movable into operative relation with the short length roll group for more quickly providing relatively small amounts of ink to the plate cylinder, such as during run-on following cessation of a printing operation. To this end, an additional feeder 17 is provided which preferably is in the form of a quick acting ink unit comprising a dispensing roll 18, transfer rolls 19, 20 and a self-regulating ink feed facility 21. The separate quick acting inking unit is adapted to provide the desired ink-water equilibrium for minimum ink consumption much more rapidly than the main ink feeder so that it is particularly adaptable for proof work or other reduced ink consumption printing.

In keeping with the invention, the quick acting unit 17 is mounted for translational movement between a retracted or inoperative position, shown in solid lines in the drawing, to an in operative position engaging the transfer roll 13, as shown in phantom. Appropriate means, such as diagrammatically indicated at 24, may be provided for effecting such movement. Alternatively, the quick acting inking unit could be mounted for pivotable movement between operative and disengaged positions.

During normal operation of the sheet fed rotary printing press, with the quick acting inking unit in a retracted position, and with the rolls 9 and 6 in respective operative engagement with the transfer rolls 15 and 12, ink is supplied to the plate cylinder from the main inking unit for printing with normal to maximum ink consumption. Upon cessation of a normal printing operation, the transfer roll 9 may be moved to its disengaged position from transfer rolls 15 and 13, as shown in phantom in FIG. 1, and the applicator roll 6 is moved to a disengaged position from transfer roll 12, so as to interrupt the flow of ink from the main inking unit 1, 2 to the plate cylinder 3. At the same time, the quick acting inking unit 17 is moved into operative engagement with

the transfer roll 13, so as to rapidly supply minimum quantities of ink to the plate cylinder for proof work, or reduced ink consumption printing. To resume normal printing, the rolls 9 and 6 again are moved into operative engagement with the main ink transfer line and the quick acting inking unit moved to its retracted position. However, when the printing operation requires substantially no ink, the change over to the main inking unit operation need not be required and only the short inking unit may be used. To prevent disturbances of the equilibrium state or of the ink layer thickness gradient of the transfer rolls 8–15 in response to an interruption of run-off in the main inking unit operation, the change over to the short inking unit operation can be coupled by known control means to the cessation of printing.

I claim:

1. A sheet-fed rotary press comprising

main ink feed means,

a plate cylinder,

a plurality of transfer and applicator rolls coupled between said main ink feed means and said plate cylinder for defining an ink flow path for transferring ink in a downstream direction from said main ink feed means to said plate cylinder during printing operations, means mounting at least one of said transfer rolls which define said flow path for movement between an operative position in said flow path and an inoperative position out of engagement with said transfer and applicator rolls downstream thereof, means for selectively moving said at least one transfer roll from said operative position to said inoperative position for interrupting the transfer of ink from said main ink feed means to said plate cylinder and for isolating a short length roll group comprising only a portion of said plurality of transfer and applicator rolls, and

additional ink feed means, and means for selectively moving said additional ink feed means from an inoperative position out of engagement with said short length roll group to an operative position engaging said short length roll group for supplying ink to said plate cylinder through a shortened flow path via said short length roll group.

2. The rotary printing press of claim 1 in which the transfer and applicator rolls of said short length group remain engaged with each other at all times.

3. The rotary printing press of claim 1 in which said transfer and applicator rolls include a plurality of applicator rolls, means mounting at least one of said applicator rolls for movement between an operative position in said ink flow path to an inoperative position out of engagement with other transfer and applicator rolls of said flow path, and means for simultaneously moving said at least one transfer roll and said at least one applicator roll from said operative to said inoperative positions for interrupting the supply of ink from said main ink feed means to said short length roll group.

4. The rotary printing press of claim 1 in which said additional ink feed means is operable for supplying lesser quantities of ink than said main ink feed means.

5. The rotary printing press of claim 4 in which said additional ink feed means is mounted for translational movement relative to said short length roll group.

* * * * *

12

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【提出日】　平成 8年 5月 2日
【あて先】　特許庁長官　殿
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【請求項の数】　22
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original claims & Spec. in English

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　【国名】　アメリカ合衆国

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　【物件名】　外国語明細書　1

　【物件名】　外国語図面　1

　【物件名】　外国語要約書　1

【書類名】 外国語明細書

1. Title of Invention

"RETRACTABLE INKING/COATING APPARATUS HAVING FERRIS MOVEMENT BETWEEN PRINTING UNITS"

2. Claims

1. Inking/coating apparatus for use in a printing press of the type having a printing unit on which a plate cylinder, a blanket cylinder and an impression cylinder are mounted for rotation, wherein the inking/coating apparatus is characterized by:

an applicator head for applying ink or coating material to a plate mounted on the plate cylinder or to a blanket mounted on the blanket cylinder, either separately or simultaneously when the inking/coating apparatus is in an operative position relative to the plate and blanket cylinders; and,

a carriage assembly for moving the applicator head to the operative position in which the applicator head is disposed laterally adjacent to the plate and blanket cylinders and for moving the applicator head from the operative position to a retracted position in which the applicator head is elevated with respect to the plate and blanket cylinders.

2. Inking/coating apparatus as set forth in claim 1, wherein the carriage assembly is characterized by:

a support arm having a first end portion constructed for pivotal attachment to the printing unit and having a second end portion pivotally coupled to the

applicator head, the applicator head being movable on the support arm to the operative position.

3. Inking/coating apparatus as set forth in claim 1, characterized in that a counterweight is coupled to the carriage assembly.

4. Inking/coating apparatus as set forth in claim 1, wherein the applicator head is characterized by:

a doctor blade assembly having a reservoir for receiving ink or liquid coating material; and,

an applicator roller coupled to the doctor blade assembly in fluid communication with the reservoir, the applicator roller being engagable with a printing plate on the plate cylinder or with a blanket on the blanket cylinder when the applicator head is in the operative position.

5. Inking/coating apparatus as set forth in claim 4, characterized in that the applicator roller is an anilox roller having a resilient transfer surface.

6. Inking/coating apparatus as set forth in claim 1, characterized in that:

a power actuator is movably coupled to the applicator head, the power actuator having a power transfer arm which is extendable and retractable; and,

movement converting apparatus is coupled to the power transfer arm for converting extension or retraction movement of the power transfer arm into pivotal movement of the applicator head relative to the carriage assembly.

7. Inking/coating apparatus as set forth in claim 6, wherein the movement converting apparatus is characterized by:

a bell crank plate having a first end portion coupled to the power transfer arm and having a second end portion for engaging a stop member;

a stop member secured to the applicator head; and,

a clevis plate secured to the carriage assembly and pivotally coupled to the bell crank plate.

8. Inking/coating apparatus as set forth in claim 1, wherein the applicator head is characterized by:

first and second side frame members pivotally coupled to the carriage assembly;

a doctor blade assembly mounted on the first and second side frame members, the doctor blade assembly including a reservoir for receiving ink or liquid coating material;

a cradle assembly mounted on the first and second side frame members, respectively;

an applicator roller mounted for rotation on the cradle assembly and coupled to the doctor blade assembly for rolling contact with ink or coating material in the reservoir, the applicator roller being engagable with a printing plate on the plate cylinder or with a blanket on the blanket cylinder when the applicator head is in the operative position; and,

a drive motor coupled to the applicator roller for rotating the applicator roller.

9. Inking/coating apparatus as set forth in claim 8, characterized in that:

the cradle assembly has first and second sockets disposed on the first and second side frame members respectively; and,

the applicator roller is mounted for rotation on the first and second sockets.

10. Inking/coating apparatus as set forth in claim 8, characterized in that

the cradle assembly includes first and second sockets disposed on the first and second side frame members, respectively, and third and fourth sockets disposed on the first and second side frame members, respectively; and,

the applicator roller is selectively mountable for rotation on either the first and second sockets or on the third and fourth sockets for applying ink

or coating material to either the plate or blanket when the applicator head is in the operative position.

11. Inking/coating apparatus as set forth in claim 1, wherein the applicator head is characterized by:

a first cradle for supporting an applicator roller for engagement with the plate when the inking/coating apparatus is in the operative position; and

a second cradle for supporting an applicator roller for engagement with the blanket when the inking/coating apparatus is in the operative position.

12. Inking/coating apparatus as set forth in claim 1, wherein the carriage assembly is characterized by:

a support arm having a first end portion pivotally coupled to the printing unit and having a second end portion;

a common pivot shaft on which the support arm second end portion and the inking/coating apparatus are pivotally mounted; and,

male and female latch members coupled between the common pivot shaft and the printing unit, with one of the latch members being secured to the common pivot shaft and the other latch member being constructed for attachment onto the printing unit, the latch members being mateable in interlocking engagement when the applicator head is in the operative position.

13. Inking/coating apparatus as set forth in claim 1, wherein the applicator head and the printing unit are characterized by:

male and female latch coupling members mounted on the carriage assembly and on the printing unit for releasably latching the carriage assembly in interlocking engagement with the printing unit when the applicator head is in the operative position.

14. Inking/coating apparatus as set forth in claim 1, wherein the carriage assembly is characterized by an elongated shank portion and a hub portion, the elongated shank portion being pivotally coupled to the applicator head and the hub portion being constructed for pivotal attachment onto the printing unit.

15. A rotary offset printing press having first and second printing units and the inking/coating apparatus of claim 1 is movably coupled to the first printing unit as set forth in claim 1, characterized by:

a dryer mounted on the first printing unit adjacent the impression cylinder of the first printing unit for discharging heated air onto a freshly printed substrate while the freshly printed substrate is in contact with said impression cylinder.

16. A rotary offset printing press as defined in claim 15, characterized in that:

an extractor is disposed adjacent the dryer for extracting hot air, moisture and volatiles from an exposure zone between the dryer and the freshly printed substrate.

17. A rotary offset printing press as defined in claim 15, characterized in that:

an intermediate transfer cylinder is coupled in sheet transfer relation with the impression cylinder of the first printing unit; and,

an interstation dryer is disposed adjacent the intermediate transfer cylinder for discharging heated air onto a freshly printed or coated substrate after it has been transferred from the impression cylinder of the first printing unit and while it is in contact with the intermediate transfer cylinder.

18. A method for rotary offset printing in a printing press of the type including first and second rotary offset printing units, and using aqueous or UV-curable printing ink or coating material in the operation of at least the first printing unit, characterized by the following steps performed at each printing unit in succession:

spot or overall coating the plate with aqueous ink/aqueous coating material or UV-curable ink/UV-curable coating material;

spot and/or overall coating the blanket with aqueous ink/aqueous coating material or UV-curable ink or UV-curable coating material;

transferring the printing ink or coating material from the printing plate to the blanket;

transferring the inked or coated image from the blanket to a substrate as the substrate is transferred through the nip between the impression cylinder and the blanket; and,

drying the ink or coating material on the freshly printed substrate before the substrate is subsequently processed.

19. A method for rotary offset printing as defined in claim 18, wherein the drying step is characterized by:

discharging high velocity, heated air onto the freshly printed/coated substrate while the freshly printed/coated substrate is in contact with the impression cylinder of the first printing unit.

20. A method for rotary offset printing as defined in claim 18, characterized by the steps:

transferring the freshly printed substrate from the first printing unit to an intermediate transfer cylinder; and,

drying the freshly printed substrate while it is in contact with the intermediate transfer cylinder.

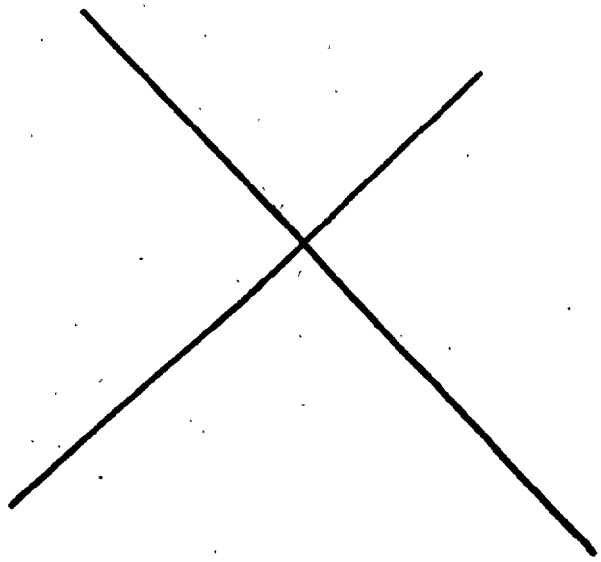
21. A method for rotary offset printing as defined in claim 18, characterized by the step:

extracting hot air, moisture and volatiles from an exposure zone above the freshly printed/coated substrate while the freshly printed/coated substrate is in contact with the impression cylinder.

22. A method for rotary offset printing as defined in claim 18, characterized by the steps:

applying a primer coating of an aqueous coating material or UV-curable coating material to a substrate in the first printing unit; and,

drying the primer coating on the substrate before the substrate is processed in the second printing unit.



3. Detailed Description of Invention

This invention relates to sheet-fed or web-fed, rotary offset or flexographic printing presses, and more particularly, to a new and improved inking/coating apparatus for the in-line application of printing inks or protective or decorative coatings to sheet or web substrates.

Conventional sheet-fed, rotary offset printing presses typically include one or more printing units through which individual sheets are fed and printed with wet ink. Since the inks used with rotary offset printing presses typically remain wet and tacky for some time after printing, special precautions must be taken to insure that the freshly printed sheets are not marked or smeared as the sheets are transferred from one printing unit to another, and while being conveyed to the sheet delivery stacker. The printed surface of the freshly printed sheet dries relatively slowly and can be smeared during subsequent transfer between printing units. In order to reduce smearing and offsetting, spray powder is applied on the printed sheet.

In some printing applications, offset and smearing are prevented by applying a protective and/or decorative coating over all or a portion of the freshly printed sheets. Various arrangements have been proposed for applying the protective or decorative coating as an in-line operation by using the last printing unit of the press as the coating application unit. However, when such in-

line coating is performed, the last printing unit cannot be used to apply ink to the sheets, and can only be used for the coating operation. Thus, while coating with these types of in-line coating apparatus, the press loses the capability of printing its full range of colors since the last printing unit is converted to a coating unit.

It will be appreciated that the time required to reconfigure a press for coating or non-coating is non-productive and costly. Accordingly, there is a need for an in-line coating apparatus that minimizes the time to clean-up from one printing run and set-up and run the next job. Where consecutive jobs require the same type of coating, particularly blanket coating, it may not be necessary to clean-up the coater between jobs. However, the coating material cannot be allowed to dry on the rollers. Therefore, especially when switching from blanket to spot coating or vice versa, or if there is a delay between jobs, it is necessary to wash-up the coater after each job is completed.

In addition, coater wash-up is necessary when switching between different coating compositions, such as aqueous and ultra violet (UV) curable coatings. Such coating materials are not interchangeable, and consequently, the coater must be washed between applications of different coating media.

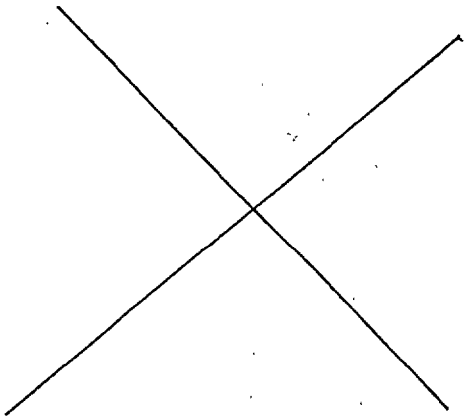
The foregoing limitations are overcome, according to the present invention, by a retractable, in-line inking/coating apparatus which is mounted on a printing

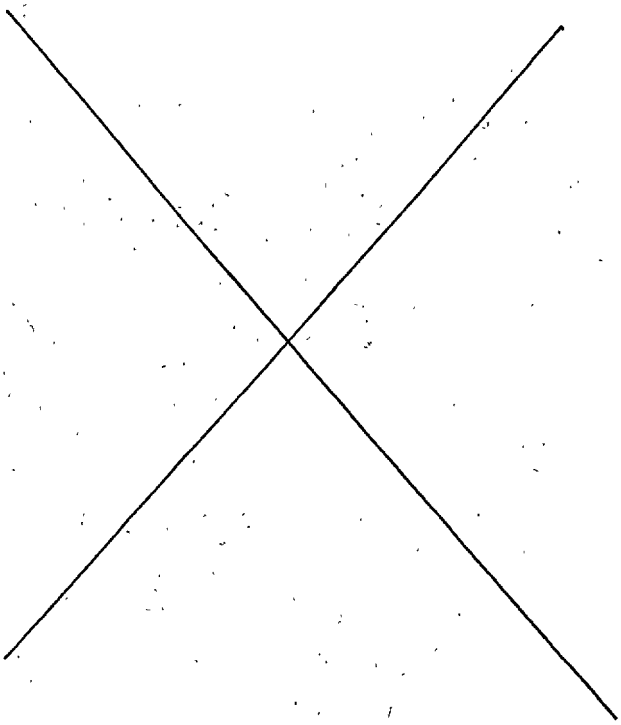
unit for pivotal, Ferris wheel movement between an operative inking/coating position and a retracted, overhead idle position. The inking/coating apparatus includes an applicator head which, is positioned in alignment with either the plate cylinder or the blanket cylinder by a carriage assembly which includes a cantilevered support arm. The support arm is pivotally coupled between the inking/coating head and the printing unit tower. This cantilevered, pivotal mounting arrangement allows the inking/coating unit to be used between two printing units, as well as on the last printing unit of the press.

In the preferred embodiment, the applicator head includes vertically spaced pairs of cradle members with one cradle pair being adapted for supporting a metal or ceramic coating roller in alignment with a blanket cylinder, and the other cradle pair supporting a resilient anilox coating roller in alignment with the plate cylinder, respectively, when the carriage assembly is in the operative position. Because of the cantilevered, pivotal support provided by the support arm, the applicator head can be lifted and lowered through an arc, similar to Ferris wheel movement, in the limited space between adjacent printing units. When fully retracted, the applicator head and carriage assembly are lifted to an elevated, retracted overhead position, preferably an overhead position overlying the printing unit tower, thus providing complete access to the interstation space and the printing unit cylinders without causing the printing unit to lose its printing capability. The

inking/coating applicator roller of the applicator head can be inspected, cleaned or replaced and the doctor blade assembly can be washed-up automatically while the inking/coating apparatus is in the retracted position.

When the inking/coating apparatus is used in combination with a flexographic printing plate and aqueous ink or aqueous coating, the water component of the aqueous ink or coating on the freshly printed sheet is evaporated by a high velocity, hot air interstation dryer and a high volume heat and moisture extractor assembly so that the freshly printed ink or coating is completely dry before the sheet is printed on the next printing unit. This quick drying flexographic printing/coating arrangement permits a base coat of ink, for example opaque white or metallic ink (gold, silver or other metallics) to be applied in the first printing unit, and then overprinted by a lithographic process on the next printing unit.





As used herein, the term "processed" refers to various printing methods which may be applied to either side of a substrate, including the application of UV-curable and aqueous inks and/or coatings. The term "substrate" refers to sheet or web material. Also, as used herein, the term "waterless printing plate" refers to a printing plate having non-image surface areas which are hydrophobic and also having image surface areas which are hydrophilic, wherein the non-image surface areas are characterized by a surface tension value which is less than the surface tension of aqueous ink, and the image surface areas are characterized by a surface tension value which is greater than the surface tension of aqueous ink. "Flexo-

graphic" refers to flexible printing plates having a relief surface which is wettable by aqueous ink or aqueous coating material.

As shown in the exemplary drawings, the present invention is embodied in a new and improved in-line inking/coating apparatus 10, for applying inks or protective and/or decorative coatings to sheets or webs printed in a sheet-fed or web-fed, rotary offset or flexographic printing press, herein generally designated 12. In this instance, as shown in FIGURE 1, the inking/coating apparatus 10 is installed in a four color printing press 12, such as that manufactured by Heidelberger Druckmaschinen AG of the Federal Republic of Germany under its designation Heidelberg Speedmaster 102V. The press 12 includes a press frame 14 coupled at one end, herein the right end, to a sheet feeder 16 from which sheets, herein designated S, are individually and serially fed into the press, and at the opposite end, with a sheet delivery stacker 20 in which the freshly printed sheets are collected and stacked. Interposed between the sheet feeder 16 and the sheet delivery stacker 20 are four substantially identical rotary offset printing units 22, 24, 26 and 28 which can print different color inks onto the sheets as they are transferred through the press 12. The printing units are housed within printing towers T1, T2, T3 and T4 formed by side frame members 14, 15.

As illustrated, the printing units 22, 24, 26 and 28 are substantially identical and of conventional design.

The first printing unit 22 includes an in-feed transfer cylinder 30, a plate cylinder 32, a blanker cylinder 34 and an impression cylinder 36, all supported for rotation in parallel alignment between the press side frames 14, 15. Each of the first three printing units 22, 24 and 26 have an interunit transfer cylinder 38 disposed to transfer the freshly printed sheets from the adjacent impression cylinder to the next printing unit via an interstation transfer cylinder 40. The last printing unit 28 is shown equipped with a delivery cylinder 42 which guides each freshly printed sheet 18 as it is transferred from the last impression cylinder 36 to a delivery conveyor system, generally designated 44, to the sheet delivery stacker 20.

The delivery conveyor system 44 as shown in FIGURE 2 is of conventional design and includes a pair of continuous delivery gripper chains 46, only one of which is shown carrying at regular spaced locations along the chains, laterally disposed gripper bars having gripper fingers for gripping the leading edge of a freshly printed sheet 18 after it leaves the nip between the delivery cylinder 42 and impression cylinder 36 of the last printing unit 28. As the leading edge is gripped by the grippers, the delivery chains 46 pull the freshly printed sheet away from the impression cylinder 36 and deliver the freshly printed sheet to the sheet delivery stacker 20.

Prior to reaching the delivery sheet stacker, the freshly printed and/or coated sheets S pass under a delivery dryer 48 which includes a combination of infra-red

thermal radiation, high velocity hot air flow and heat and moisture extraction for drying the ink and/or the protective/decorative coating on the freshly printed sheets.

In the exemplary embodiment shown in FIGURE 1, the first printing unit 22 is equipped with a flexographic printing plate, and does not require an inking roller train or a dampening system. If an ink roller train is mounted on the first printing unit, the form rollers are retracted and locked off when the printing unit goes on impression. Flexographic aqueous ink is supplied by the inking/coating unit 110. The remaining printing units 24, 26 and 28 are equipped for lithographic printing and include an inking apparatus 50 having an inking roller train 52 arranged to transfer ink from an ink fountain 54 to the plate cylinder 32. This is accomplished with the aid of a fountain roller 56 and a ductor roller. The fountain roller 56 projects into the ink fountain 54, whereupon its surface is wetted with printing ink Q. The printing ink Q is transferred intermittently to the inking roller train 52 by the ductor roller. The inking roller train 52 supplies printing ink Q to the image ares of a printing plate P mounted on the plate cylinder 32.

The printing ink Q is transferred from the printing plate P to an ink receptive blanket B which is mounted on the blanket cylinder 34. The inked image carried on the blanket B is transferred to a sheet S as the sheet is transferred through the nip between the impression cylinder 36 and the blanket B.

The inking roller arrangement 52 illustrated in FIGURE 1 is exemplary for use in combination with lithographic ink printing plates. It will be understood that dampening rollers (not illustrated) will be in direct engagement with the lithographic plate P, but are not used in combination with the flexographic plate of printing unit 22.

Referring now to FIGURE 4, FIGURE 5 and FIGURE 6, the in-line inking/coating apparatus 10 includes a carriage assembly 58 which supports an applicator head 60. The applicator head 60 includes a hydraulic motor 62, a lower gear train 64, an upper gear train 65, an applicator roller 66 and a doctor blade assembly 68. The external peripheral surface of the applicator roller 66 is inserted into wetting contact with liquid coating material or ink contained in a reservoir 70. The reservoir 70 is continuously supplied with ink or coating which is circulated through the reservoir 70 from an off-press source by a pump (not illustrated). The hydraulic motor 62 drives the applicator roller 66 synchronously with the plate cylinder 32 and the blanket cylinder 34 in response to an RPM control signal from the press drive (not illustrated) and a feedback signal developed by a tachometer 72. While a hydraulic drive motor is preferred, an electric drive motor can be used.

The applicator roller 66 is preferably a fluid metering anilox roller which transfers measured amounts of printing ink or coating material onto the printing plate or

blanket. The surface of an anilox roller is engraved with an array of closely spaced, shallow depressions referred as "cells". Ink or coating material from the reservoir 70 flows into the cells as the anilox roller turns through the reservoir. The transfer surface of the anilox roller is scraped with a doctor blade 73 to remove excess ink or coating. The ink or coating remaining on the anilox roller is the measured amounts contained within the cells.

The applicator roller 66 is cylindrical and may be constructed in various diameters and lengths, containing cells of various sizes and shapes. The volumetric capacity of an anilox roller is established during manufacturing and is dependent upon the selection of cell size, shape and number of cells per unit area. Depending upon the intended application, the cell pattern may be fine (many small cells per unit area) or coarse (fewer larger cells per unit area).

By applying the ink or coating material through the inking/coating applicator head 60, more ink or coating material can be delivered to the sheet S as compared with the inking roller train of a lithographic printing unit. Moreover, color intensity is stronger and more brilliant because the flexographic ink is applied at a much larger film thickness than can be applied by the lithographic process and is not diluted by dampening solution.

The inking/coating applicator head 60 includes side frame members 74, 76 that support the applicator roller 66, gear train 64, gear train 65, doctor blade

assembly 68 and the drive motor 62. The applicator roller 66 is supported at opposite ends on a lower cradle formed by a pair of end plates 78, 80 which hold the applicator roller 66 in parallel alignment with the blanket cylinder 34 (FIGURE 5). The side frames 74, 76 are also provided with an upper cradle formed by a pair of side plates 82, 84 which are vertically spaced with respect to the lower side plates 78, 80. Each cradle has a pair of sockets 79, 81 and 83, 85, respectively, for holding the applicator roller 66 for spot coating or inking engagement against the plate P of the plate cylinder 32 (FIGURE 4) or the blanket B of the blanket cylinder 34.

Preferably, the applicator roller 66 for the upper cradle (plate) position is an anilox roller having a resilient transfer surface. In the dual cradle arrangement, the press operator can quickly change over from blanket inking/coating and plate inking/coating with minimum press down time, since it is only necessary to remove and reposition or replace the applicator roller 66, and wash-up the doctor blade assembly if changing from ink to coating or vice versa. The capability to selectively operate in either the flexographic mode or the lithographic mode and to print or coat from either the plate or blanket position is referred to herein as the "LITHOFLEX" process.

Referring again to FIGURE 2 and FIGURE 3, the applicator head 60 is supported by the carriage assembly 58 in a cantilevered, pivotal arrangement which allows the dual cradle inking/coating apparatus 10 and a single cradle

inking/coating apparatus 110 to be used between any two adjacent printing units, as well as used on the first and last printing units of the press. This is made possible by a pair of cantilevered support arms 88, 90 that are pivotally coupled to the side plates 74, 76, respectively, on a pivot shaft 77. Each support arm has a hub portion 88A, 90A, respectively, and an elongated shank portion 88B, 90B, respectively.

The cantilevered support arms are pivotally mounted on the printing tower by pivot blocks 92, 94, respectively. The hub portions 88A, 90A are journalled for rotation on pivot shafts 96, 98, respectively. The pivot blocks 92, 94 are securely fastened to the tower 14D, so that the carriage assembly 86 is pivotally suspended from the pivot shafts 96, 98 in a cantilevered Ferris support arrangement. The shank portions 88B, 90B are pivotally coupled to the pivot shaft 77, so that the carriage assembly 58 and the applicator head 60 are capable of independent rotation with respect to each other and with respect to the pivot shaft 77. By this arrangement, the applicator head 60 is pivotally suspended from the pivot shaft 77, and remains in an upright orientation as the support arms rotate from the operative position to the fully retracted position, and vice versa.

Thus, the cradles 78, 80 and 82, 84 position the applicator roller 66 in vertical and horizontal alignment with the plate cylinder or blanket cylinder when the applicator head is extended to the operative position, for

example as shown in FIGURE 4 and FIGURE 5. Moreover, because of the transverse relationship between the hub portion and shank portion of the support arms, the applicator head 60 and carriage assembly 58 are capable of rotating through a Ferris arc without touching the adjacent printing tower. This makes it possible to install the inking/coating apparatus 10 on any intermediate printing unit tower (T2, T3), and as well as on the first printing unit tower T1 and the last printing unit tower T4. Additionally, when the inking/coating unit 10 is in the operative position, the lateral projection of the applicator head 60 into the interstation space between printing units is minimized. This assures virtually unrestricted operator access to the interstation space between adjacent printing units when the applicator head is engaged in the operative position, and completely unrestricted access when the carriage assembly 58 is retracted.

Rotation of the carriage assembly 58 is counterclockwise from the retracted, idle position (shown in phantom in FIGURE 1) to the operative position (FIGURE 4 and FIGURE 5). The carriage assembly 58 can be adapted for clockwise rotation from the retracted position to the operative position for engagement of the applicator roller to either the plate or the blanket on the dampener side of the tower, assuming that access to the plate and blanket is not restricted by dampener rollers or the like.

Rotational movement of the support arms 88, 90 is assisted by counterweights 100, 102 which are secured to

the support arms, respectively, for concurrent rotation with respect to the pivot blocks 92, 94. With the passive assistance of the counterweights, the press operator can easily move the inking/coating assembly 10 from the engaged operative position as shown in FIGURE 4 to the fully retracted, idle position as shown in phantom in FIGURE 1. Preferably, rotation of the carriage assembly 58 is assisted by a torsion spring, electric motor or hydraulic motor.

The inking/coating apparatus 10 is releasably locked into the operative position as shown in FIGURE 4 by releasable latch couplings 103, 105 that secure the support arms 88, 90 to the press side frames 14, 15, respectively, of the printing unit tower T4 in the operative position. Coating engagement of the applicator roller 66 against the blanket cylinder 34 is produced by power actuators, preferably pneumatic cylinders 104, 106 which have extendable/retractable power transfer arms 104A, 106A, respectively. The pneumatic cylinder 104 is pivotally coupled to the support arm 88 by a pivot linkage 108, and the second pneumatic cylinder 106 is pivotally coupled to the support arm 90 by a pivot linkage 109. In response to actuation of the pneumatic cylinders 104, 106, the power transfer arms are retracted. As the transfer arms retract, the inking/coating head 60 is rotated counterclockwise on the pivot shaft 77, thus moving the applicator roller 66 into coating engagement with the blanket cylinder 34.

The pivot linkage 108 includes a bell crank 111 which is mounted for pivotal movement on a pin 113. The pin 113 is supported by a clevis plate 115 which is attached to the support arm 88. One end of the bell crank is pivotally coupled to the actuator arm 104A, and a cam roller 117 is mounted for rotation on its opposite end.

The cam roller 117 is engagable against an adjustable stop 119 which is rigidly secured to the side plate 74. Counterclockwise shifting of the handle H moves a cam follower 121 into a latch pocket 123 of a receiver block 125 as the cam roller 117 is moved into engagement with the adjustable stop 119 in the interlocked, operative position. Referring to FIGURE 4, FIGURE 5 and FIGURE 6, the receiver block 125 is secured to the delivery side of the printing unit tower by machine screws.

When the plate P goes on impression, power is applied to the pneumatic actuator 104 and the power transfer arm 104A retracts, thus causing the bell crank 111 to rotate counterclockwise about the pin 113. The torque applied by the pneumatic actuator 104 is transmitted to the applicator head 60 through the cam roller 117 and the adjustable stop 119. Counterclockwise movement of the applicator head 60 relative to the support shaft 77 carries the applicator roller 66 into engagement with the plate P.

The adjustable stop 119 has a threaded bolt 119A which is engagable with the cam roller 117. The striking point of engagement is preset so that the applicator roller 66 is properly positioned for engagement with the plate P

or blanket B in the operative position when the applicator head 60 is interlocked with the press frame 14 and the printing unit goes on impression.

Referring to FIGURE 5, an inking/coating apparatus 110 having a single head is illustrated. The construction of this alternative embodiment is identical in all respects with the dual head arrangement, with the exception that only a single gear train and a single cradle for holding the applicator roller is provided. In both embodiments, the inking/coating head 60 remains upright as it swings through an arc, comparable to the movement of a Ferris wheel. Because of the upright orientation of the inking/coating head 60 as it moves between the extended and retracted positions, the usual platform spacing between printing unit towers provides adequate clearance to permit extension and retraction of the carriage assembly 58 without interference with operator access to the printing units. This is a significant advantage in that it permits the in-line inking/coating apparatus 10 to operate effectively in the interstation space between any adjacent printing units, and without blocking or obstructing access to the cylinders of the printing units when the inking/coating apparatus is in the retracted position (as indicated in phantom in FIGURE 1).

Moreover, when the in-line inking/coating apparatus is in the fully retracted position, the applicator roller 66 is conveniently positioned on the dampener side of the printing unit for inspection, clean-up or

replacement. Additionally, the doctor blade assembly is also conveniently positioned for inspection, removal, adjustment or clean-up. Also, the doctor blade reservoir and coating circulation lines can be cleaned while the press is running as well as when the press has been stopped for change-over from one type of ink or coating material to another.

When the inking/coating apparatus is used for applying an aqueous ink or an aqueous coating material, the water component on the freshly printed sheet S is evaporated by a high velocity, hot air interstation dryer and high volume heat and moisture extractor units 112 and 114, as shown in FIGURE 1, FIGURE 4 and FIGURE 5. The dryer/extractor units 112 and 114 are oriented to direct high velocity heated air onto the freshly printed/coated sheets as they are transferred by the interunit and the intermediate transfer cylinders 36, 40. By this arrangement, the freshly printed aqueous ink or coating material is completely dry before the sheet is overprinted in the next printing unit.

The high velocity, hot air dryer and high performance heat and moisture extractor units 112, 114 utilize high velocity air jets which scrub and break-up the moist air level which clings to the surface of each freshly printed sheet. Within each dryer, high velocity air is heated to a high temperature as it flows across a resistance heating element within an air delivery baffle tube. High velocity jets of hot air are discharged through

multiple airflow apertures through an exposure zone Z (FIGURE 4 and FIGURE 5) onto the freshly printed/coated sheet S as it is transferred by the transfer cylinder 36 and intermediate transfer cylinder 40, respectively. Each dryer assembly includes a pair of air delivery dryer heads which are arranged in spaced, side-by-side relation as shown in FIGURE 4 and FIGURE 5.

The high velocity, hot moisture-laden air displaced from each freshly printed sheet is extracted from the dryer exposure zone Z and completely exhausted from the printing unit by the high volume extractors. Each extractor head includes a manifold coupled to the dryer heads and draws the moisture, volatiles and high velocity hot air through a longitudinal gap between the dryer heads. According to this arrangement, each printed sheet is dried before it is run through the next printing unit.

The water-based inks used in flexographic printing dry at a relatively moderate drying temperature provided by the interstation high velocity hot air dryers/extractors 112, 114. Consequently, print quality is substantially improved since the aqueous ink is dried at each printing unit before it enters the next printing unit. Moreover, back-trapping on the blanket of the next printing unit is completely eliminated. This interstation drying arrangement makes it possible to print aqueous inks such as metallic ink and opaque white ink at one printing unit, and then overprint at the next printing unit.

This arrangement also permits the first printing unit to be used as a coater in which an aqueous coating is applied to low grade paper, for example recycled paper, to trap and seal in lint, dust, spray powder and other debris and provide a smoother, durable surface that can be overprinted in the next printing unit. The first down coating seals the surface of the low grade, rough substrate and improves overprinted dot definition while preventing strike-through and show-through. A UV-curable protective and/or decorative coating can be applied over the first down overprinted (aqueous) coating in the last printing unit.

Preferably, the applicator roller 66 is constructed of metal or ceramic when it is used for applying a coating material to the blanket B on the cylinder 34. When the applicator roller 66 is applied to the plate, it is preferably constructed as an anilox roller having a resilient transfer surface for engaging a flexographic printing plate. Suitable resilient roller surface materials include Buna N synthetic rubber and EPDM (terpolymer elastomer).

It will be appreciated that the inking/coating apparatus 10 is capable of applying a wide range of ink types, including fluorescent (Day Glo), pearlescent, metallics (gold, silver and other metallics), glitter, scratch and sniff (micro-encapsulated fragrance), scratch and reveal, luminous, pressure-sensitive adhesives and the like.

The press operator can eliminate the dampener roller assembly altogether, and the inking/coating apparatus 10 can selectively apply aqueous inks and coatings to a flexographic or waterless printing plate and the blanket. Moreover, overprinting of the aqueous inks and coatings can be carried out in the next printing unit since the aqueous inks and coatings are completely dried by the high velocity, hot air interstation dryer and high volume heat and moisture extractor assembly.

The aqueous inks and coatings as used in the present invention contain colored pigments and/or soluble dyes, binders that fix the pigments onto the surface of the printed sheet, and waxes, defoamers and thickeners. Aqueous printing inks predominantly contain water as a solvent, diluent and/or vehicle. The thickeners which are preferred include algonates, starch, cellulose and its derivatives, for example cellulose esters or cellulose ethers and the like. Coloring agents including organic as well as inorganic pigments may be derived from dyes which are insoluble in water. Also, the printing ink may contain water and can be predominantly glycol or the like, with the pigment being bound by an appropriate resin. When metallic inks are printed, the cells of the anilox roller must be appropriately sized to prevent the metal particles from getting stuck within the cells. The cell size is critical, and for metallic gold ink, the anilox roller should have a screen line count in the range of 175-300 lines per inch (69-118 lines per cm).

The inking/coating apparatus 10 can also apply UV-curable inks and coatings. If UV-curable inks and coatings are utilized, ultra-violet dryers/extractors are installed adjacent the high velocity hot air dryer/extractor units 112, 114, respectively.

It will be appreciated that the inking/coating apparatus 10 described herein makes it possible to selectively operate a printing unit in either the flexographic printing mode or the lithographic printing mode, while also providing the capability to print or coat from either the plate or blanket position. The dual cradle support arrangement of the present invention makes it possible to quickly change over from inking/coating at the blanket cylinder position to inking/coating at the plate cylinder position with minimum press down-time, since it is only necessary to remove and reposition or replace the applicator roller 66 while the printing/inking apparatus is in the retracted position.

Moreover, the press operator may elect to spot or overall coat with aqueous ink/coating from the plate during one job, and then spot and/or overall coat from the blanket during the next job. Since the doctor blade assembly can be flushed and washed-up quickly and the applicator roller can be replaced quickly, it is possible to spot coat or overall coat from the plate position or the blanket position with aqueous inks or coatings during the first press run and then spot coat or overall coat with UV-curable inks or coatings from the plate position or from

the blanket position during the next press run. The inking/coating apparatus 10 is completely out of the way in the retracted position; consequently, the doctor blade reservoir and supply lines can be flushed and washed-up by automatic wash-up equipment while the printing unit is printing another job.

The positioning of the applicator head and roller assembly relative to the plate and blanket is repeatable to a predetermined, preset impression position. Consequently, no printing unit adjustment or alteration is required, except for flushing the doctor blade assembly and cleaning or replacing the applicator roller to accommodate a different kind of ink or coating material. Although manual extension and retraction have been described in connection with the exemplary embodiment, extension to the operative position and retraction to a non-operative idle position can be carried out automatically by hydraulic or electric motor servomechanisms.

The Ferris wheel support arrangement allows the inking/coating apparatus to operate effectively in the interstation space between any adjacent printing units, as well as on the first or last printing units of the press, without blocking or obstructing the interstation space or restricting operator access to the cylinders of any of the printing units.

Finally, because the inking/coating apparatus of the present invention is mounted on a printing unit tower and is extendable to the operative position without

requiring adjustment or alteration of the printing unit cylinders, it can be used for applying printing ink or coating material to the blanket cylinder of a rotary offset web press, or to the blanket of a dedicated coating unit.

4. Brief Description of Drawings

FIGURE 1 is a schematic side elevational view of a sheet-fed, rotary offset printing press having inking/coating apparatus embodying the present invention;

FIGURE 2 is a perspective view of the printing press of FIGURE 1 in which a dual head inking/coating apparatus is in the operative coating position and a single head coater is in a retracted, overhead position;

FIGURE 3 is an enlarged simplified perspective view showing one side of the single head inking/coating apparatus of FIGURE 1 in the operative position;

FIGURE 4 is a simplified side elevational view showing the dual head inking/coating apparatus in the operative coating position for spot or overall coating from the blanket position;

FIGURE 5 is a simplified side elevational view showing the single head inking/coating apparatus in the operative coating position for spot or overall coating from the plate position; and,

FIGURE 6 is a simplified side elevational view of the dual head inking/coating apparatus of FIGURE 4, partially broken away, which illustrates the hydraulic drive assembly and doctor blade assembly.

【書類名】 外国語図面

FIG. 1

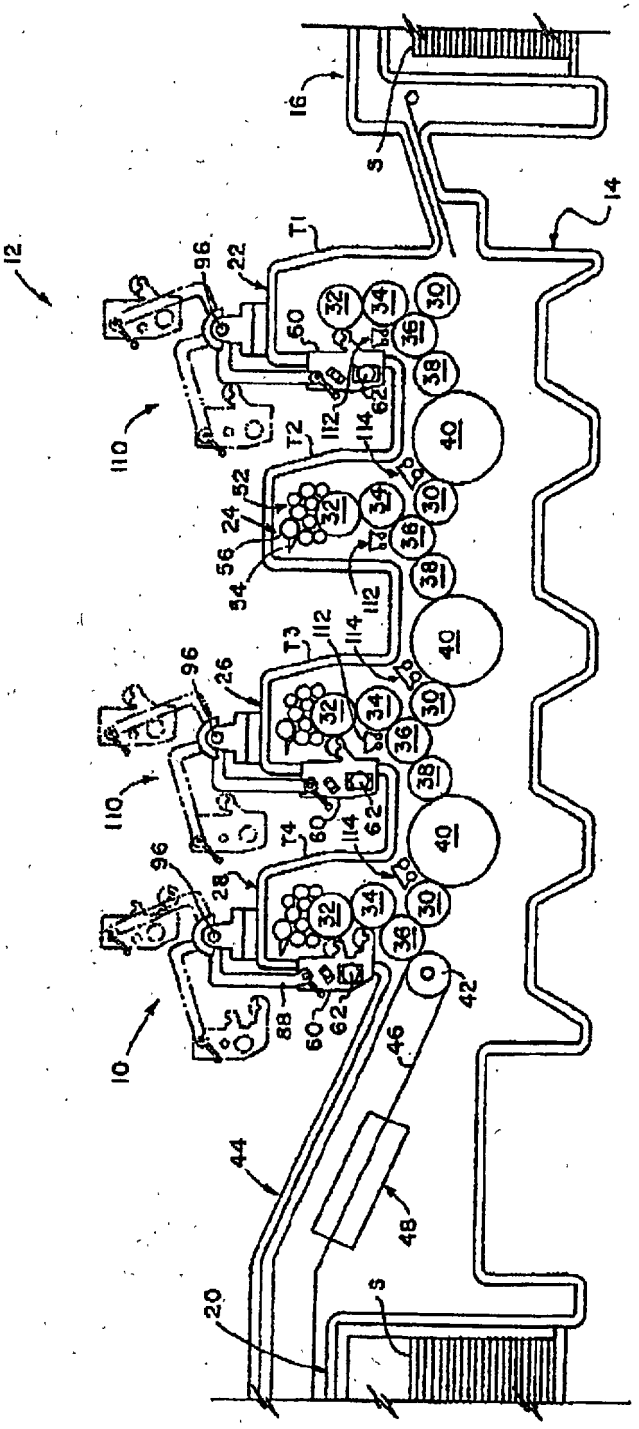


FIG. 2

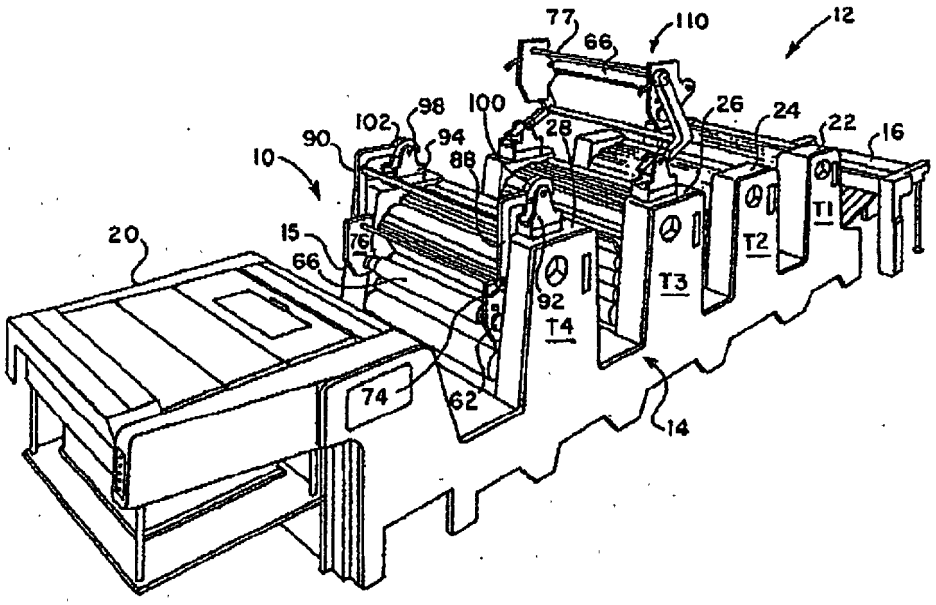

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FIG. 3

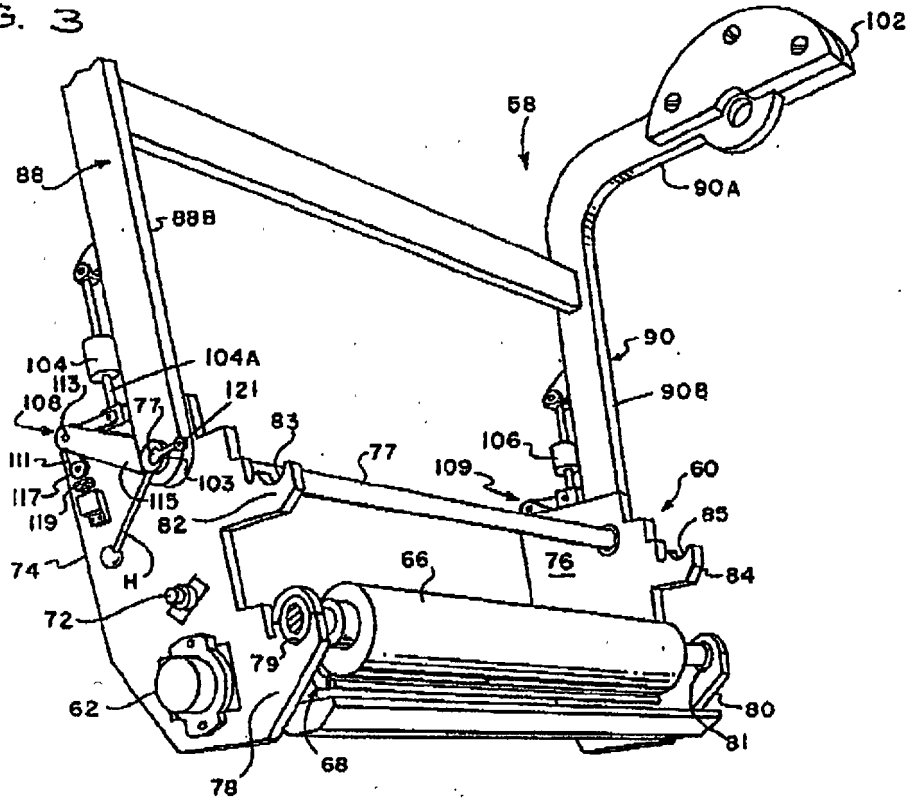
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FIG. 4

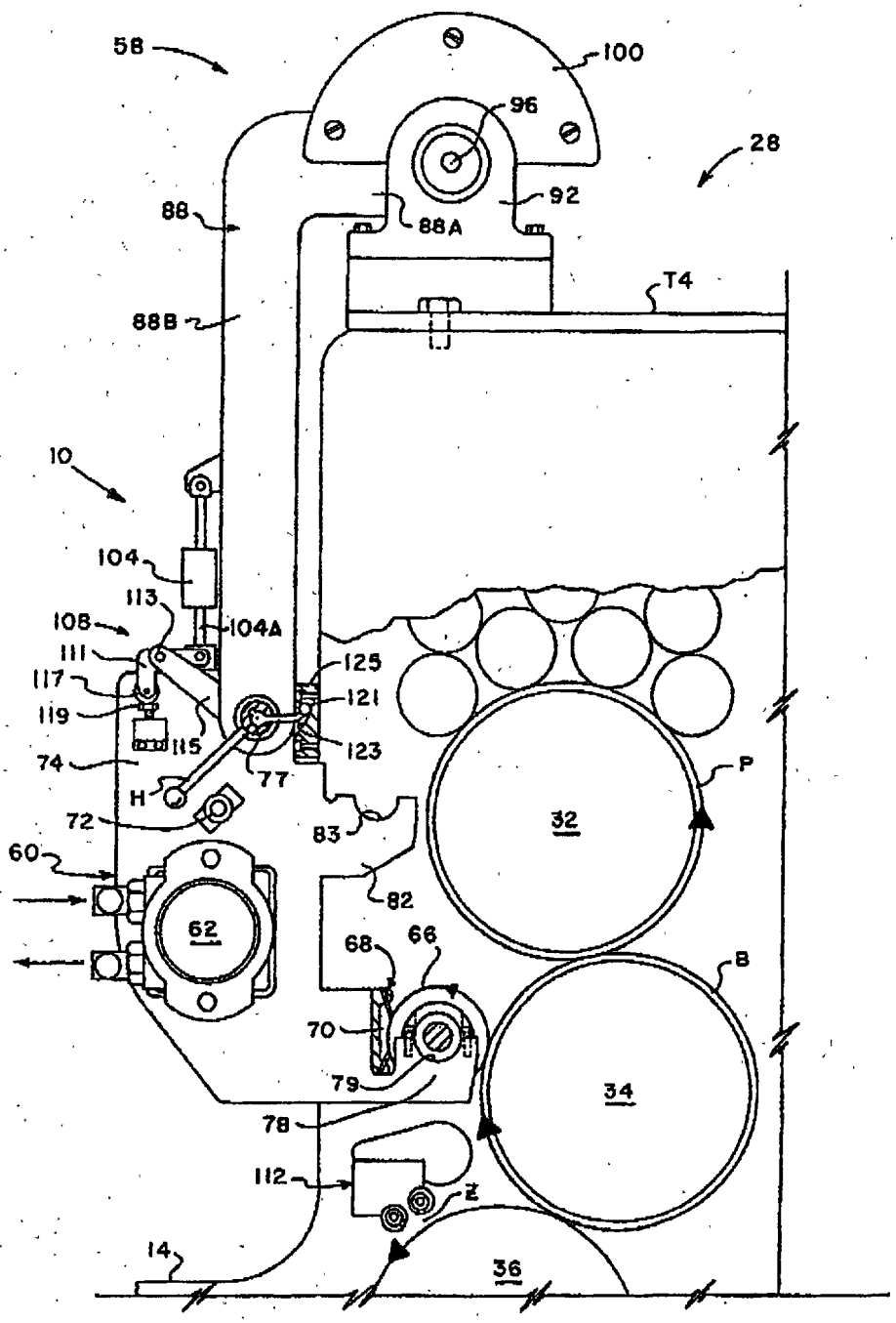
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FIG. 5

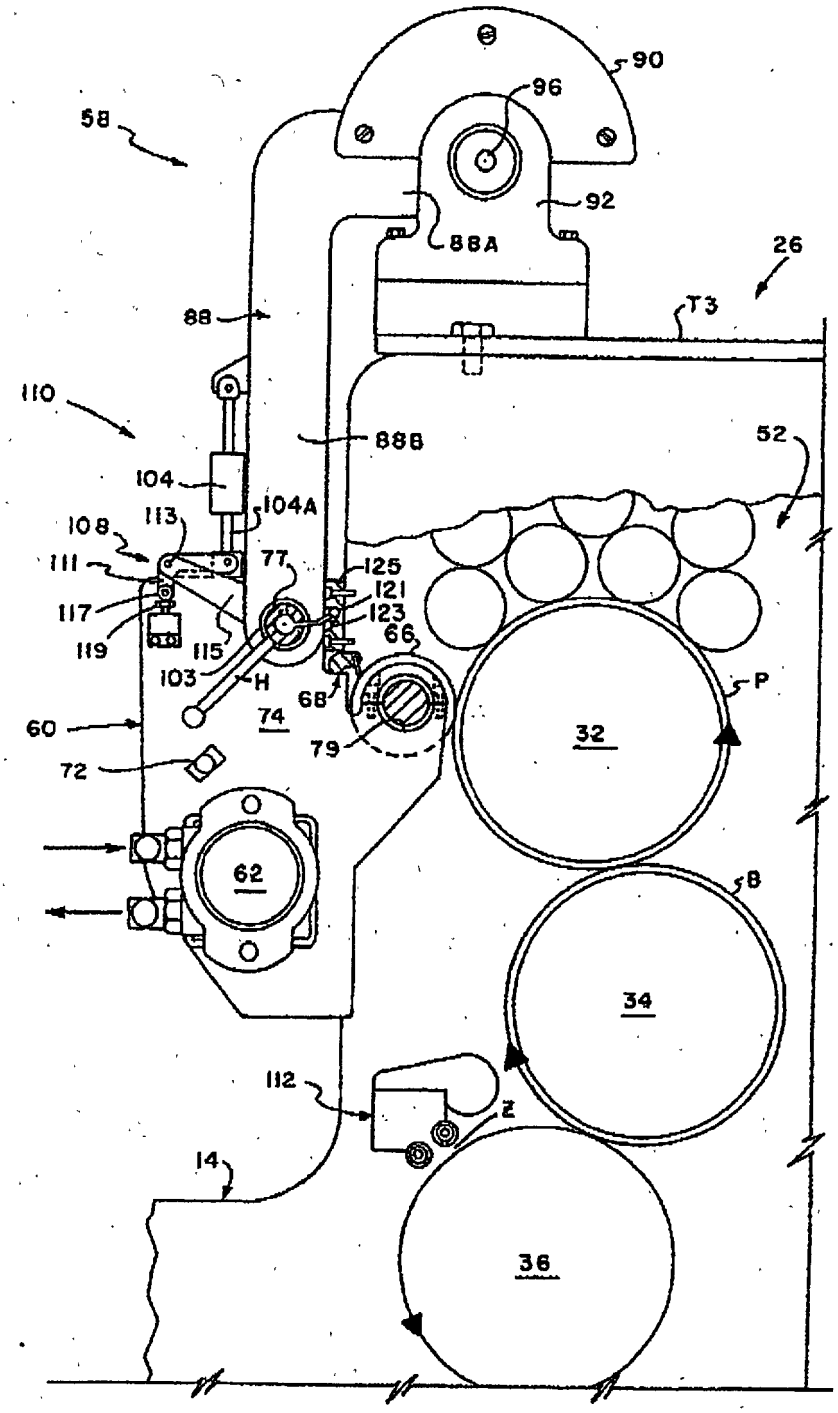
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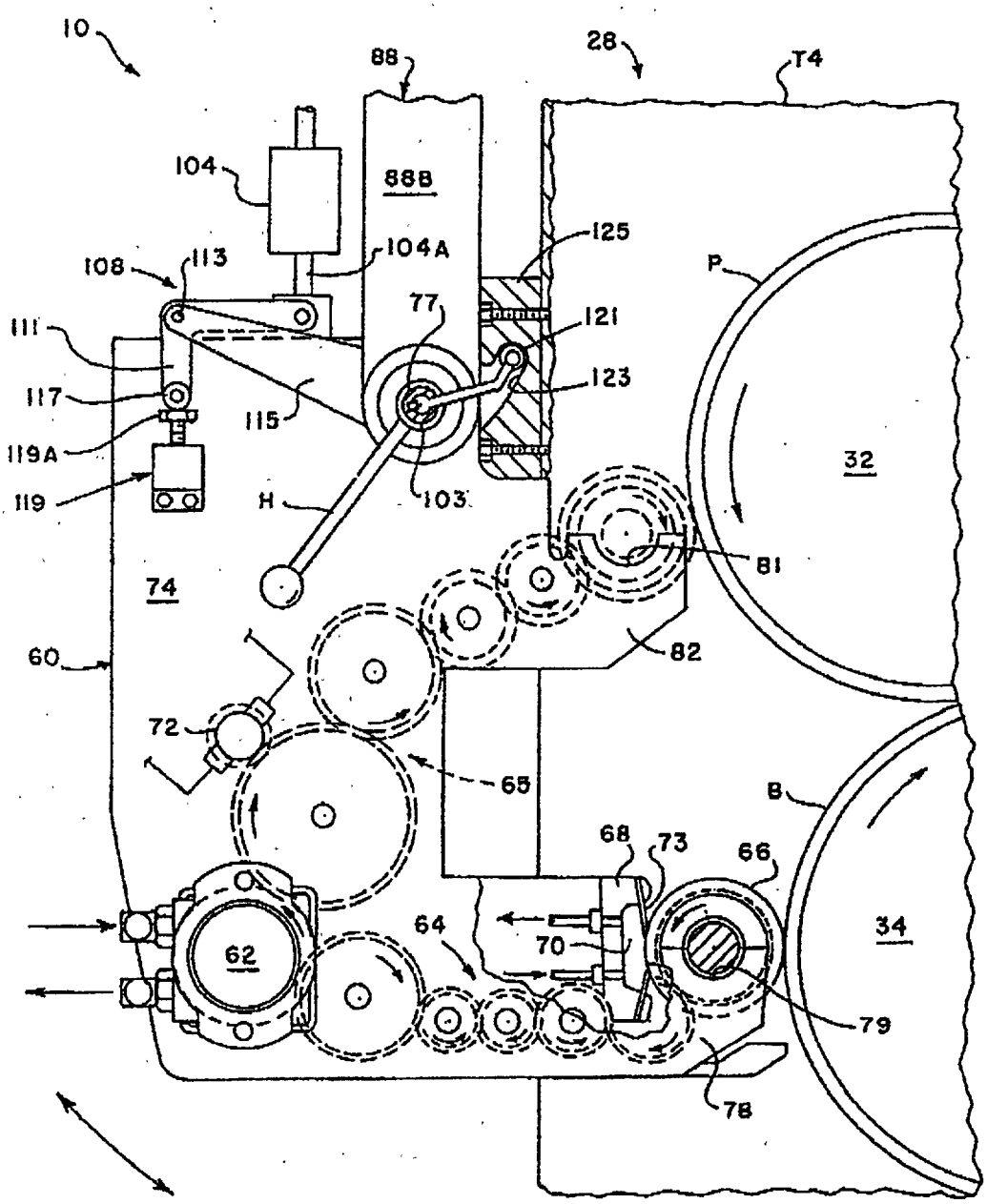
FIG. 6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【書類名】 外国語要約書

1. Abstract

A retractable in-line inking/coating apparatus selectively applies either spot or overall ink/coating material to a blanket or flexographic plate on a blanket cylinder, or spot or overall ink/coating to a flexographic printing plate on a plate cylinder in a rotary offset printing press. The inking/coating apparatus is pivotally mounted on the tower of a printing unit or dedicated coating unit, and is extendable into and retractable out of an inking/coating position by a carriage assembly which is pivotally coupled to the printing unit tower. Because of the pivotal support provided by a cantilevered support arm, the inking/coating apparatus is extended and retracted through a Ferris wheel arc between adjacent printing units.

2. Representative Drawing

FIG. 1

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【あて先】　特許庁長官　清川　佑二　殿

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　【出願日】　平成 8年 5月 2日提出の特許願

　【整理番号】　KK2016NF

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　【弁理士】

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　【弁理士】

　【氏名又は名称】　菊谷　公男

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【提出物件の目録】

　【物件名】　外国語明細書の翻訳文　1

09315796 . 050901

Translation of Claims & Spec

【物件名】　外国語図面の翻訳文　1

【物件名】　外国語要約書翻訳文　1

【書類名】　明細書

【発明の名称】　印刷ユニット相互間でフェリス運動をする引込み自在なインキング／コーティング装置

【特許請求の範囲】

【請求項１】　版胴、ゴム胴及び圧胴が回転自在に取り付けられた印刷ユニットを備えた形式の印刷機に用いられるインキング／コーティング装置において、インキング／コーティング装置が版胴及びゴム胴に対して作動位置にあるときに、インキ又はコーティング材料を、版胴に取り付けられた版又はゴム胴に取り付けられたブランケットに個別又は同時のいずれかで付着させるアプリケータヘッドと、アプリケータヘッドを、アプリケータヘッドが版胴及びゴム胴に横方向に隣接して配置された作動位置に移動させたり、アプリケータヘッドを、アプリケータヘッドが版胴及びゴム胴に対して高い位置にある引込み位置に移動させるキャリジ組立体とを有することを特徴とするインキング／コーティング装置。

【請求項２】　キャリジ組立体は、印刷ユニットに回動自在に取り付けられるよう構成された第１の端部及びアプリケータヘッドに回動自在に結合された第２の端部を備えた支持アームを有し、アプリケータヘッドは、支持アームで支えられた状態で作動位置に移動できることを特徴とする請求項１記載のインキング／コーティング装置。

【請求項３】　バランスウェイトは、キャリジ組立体に結合されていることを特徴とする請求項１記載のインキング／コーティング装置。

【請求項４】　アプリケータヘッドは、インキ又は液状コーティング材料を受け入れるリザーバを備えたドクターブレード組立体と、リザーバと連通状態でドクターブレード組立体に結合されたアプリケータローラとを有し、アプリケータローラは、アプリケータヘッドが作動位置にあるときに、版胴に取り付けられた版又はゴム胴に取り付けられたブランケットに係合できることを特徴とする請求項１記載のインキング／コーティング装置。

【請求項５】　アプリケータローラは、弾性移送面を備えたアニロックスローラであることを特徴とする請求項４記載のインキング／コーティング装置。

【請求項６】　アプリケータヘッドに可動に結合されていて、伸縮自在な動

力伝達アームを備えた動力アクチュエータと、動力伝達アームに結合されていて、動力伝達アームの伸縮運動をキャリジ組立体に対するアプリケータヘッドの回動運動に変換する運動変換装置とを有することを特徴とする請求項１記載のインキング／コーティング装置。

【請求項７】　運動変換装置は、動力伝達アームに結合された第１の端部及びアプリケータヘッドに固定された停止部材に係合する第２の端部を備えたベルクランクプレートと、キャリジ組立体に固定されていてベルクランクプレートに回動自在に結合されたクレビスプレートとを含むことを特徴とする請求項６記載のインキング／コーティング装置。

【請求項８】　アプリケータヘッドは、キャリジ組立体に回動自在に結合された第１及び第２のサイドフレーム部材と、第１及び第２のサイドフレーム部材に取り付けられていて、インキ又は液状コーティング材料を受け入れるリザーバを含むドクターブレード組立体と、第１及び第２のサイドフレーム部材にそれぞれ取り付けられたクレードル組立体と、クレードル組立体に回転自在に取り付けられると共にドクターブレード組立体に結合されていて、転動しながらリザーバ内のインキ又はコーティング材料と接触し、アプリケータヘッドが作動位置にあるとき、版胴に取り付けられた版又はゴム胴に取り付けられたブランケットに係合できるアプリケータローラと、アプリケータローラに結合されていて、アプリケータローラを回転させる駆動モータとを有することを特徴とする請求項１記載のインキング／コーティング装置。

【請求項９】　クレードル組立体は、第１及び第２のサイドフレーム部材にそれぞれ設けられた第１及び第２のソケットを有し、アプリケータローラは、第１及び第２のソケットに回転自在に取り付けられていることを特徴とする請求項８記載のインキング／コーティング装置。

【請求項１０】　クレードル組立体は、第１及び第２のサイドフレーム部材にそれぞれ設けられた第１及び第２のソケットと、第１及び第２のサイドフレーム部材にそれぞれ設けられた第３及び第４のソケットとを有し、アプリケータローラは、アプリケータヘッドが作動位置にあるとき、インキ又はコーティング材料を版又はブランケットのいずれかに付着させるよう第１及び第２のソケット又

は第３及び第４のソケットのいずれかに回転自在に選択的に取り付けることができることを特徴とする請求項８記載のインキング／コーティング装置。

【請求項１１】　アプリケータヘッドは、インキング／コーティング装置が作動位置にあるとき、版に係合できるようアプリケータローラを支持する第１のクレードルと、インキング／コーティング装置が作動位置にあるとき、ブランケットに係合できるようアプリケータローラを支持する第２のクレードルとを有することを特徴とする請求項１記載のインキング／コーティング装置。

【請求項１２】　キャリジ組立体は、印刷ユニットに回動自在に結合された第１の端部、及び第２の端部を備えた支持アームと、支持アームの第２の端部及びインキング／コーティング装置が回動自在に取り付けられた共通のピボットシャフトと、共通ピボットシャフトと印刷ユニットとの間に結合された雄型及び雌型ラッチ部材とを有し、ラッチ部材のうち一方は、共通ピボットシャフトに固定され、他方のラッチ部材は、印刷ユニットに取付け自在に構成され、ラッチ部材は、アプリケータヘッドが作動位置にあるときに、インターロック係合状態で相互に嵌合できることを特徴とする請求項１記載のインキング／コーティング装置。

【請求項１３】　アプリケータヘッド及び印刷ユニットは、キャリジ組立体及び印刷ユニットに取り付けられていて、アプリケータヘッドが作動位置にあるときに、キャリジ組立体を印刷ユニットに対してインターロック係合状態に解除自在に係止する雄型及び雌型ラッチ結合部材を有することを特徴とする請求項１記載のインキング／コーティング装置。

【請求項１４】　キャリジ組立体は、細長いシャンク部分及びハブ部分を有し、細長いシャンク部分は、アプリケータヘッドに回動自在に結合され、ハブ部分は、印刷ユニットに回動自在に取り付けられるよう構成されていることを特徴とする請求項１記載のインキング／コーティング装置。

【請求項１５】　第１及び第２の印刷ユニットを有するオフセット輪転印刷機であって、請求項１記載のインキング／コーティング装置が請求項１に記載されているように第１の印刷ユニットに可動に結合されていて、第１の印刷ユニットの圧胴に隣接して第１の印刷ユニットに取り付けられていて、印刷されたばか

りの基材が圧胴と接触しているときに、加熱空気を送風して印刷基材に当てる乾燥装置を有することを特徴とするオフセット輪転印刷機。

【請求項１６】　高温空気、水分及び揮発分を乾燥装置と印刷基材との間の暴露域から除去するためのエキストラクタが、乾燥装置に隣接して配置されていることを特徴とする請求項１５記載のオフセット輪転印刷機。

【請求項１７】　中間渡し胴が、第１の印刷ユニットの圧胴と枚葉紙移送関係をなして結合され、インターステーション乾燥装置が、中間渡し胴に隣接して配置されていて、印刷又は被覆が施されたばかりの基材を第１の印刷ユニットの圧胴から移送したあとであって、中間渡し胴と接触しているときに、加熱空気を送風して基材に当てるようになっていることを特徴とする請求項１５記載のオフセット輪転印刷機。

【請求項１８】　第１及び第２のオフセット輪転印刷ユニットを含む形式の印刷機で、少なくとも第１の印刷ユニットの作動中に水性又は紫外線硬化性印刷インキマニホルド湖はコーティング材料を用いてオフセット輪転印刷をする方法において、版を水性インキ／水性コーティング材料又は紫外線硬化性インキ／紫外線硬化性コーティング材料によりスポット又はオーバーオール状態でコーティングし、ブランケットを水性インキ／水性コーティング材料又は紫外線硬化性インキ／紫外線硬化性コーティング材料によりスポット状態であると共に、或いはオーバーオール状態でコーティングし、印刷インキ又はコーティング材料を印刷版からブランケットに転移し、基材が圧胴とブランケットとの間のニップを通って移送されているときに、インキング又はコーティングされた画線をブランケットから基材に転移し、基材が次の処理を施される前に、印刷基材上のインキ又はコーティング材料を乾燥させ、上記工程を各印刷ユニットで連続して実施することを特徴とするオフセット輪転印刷方法。

【請求項１９】　乾燥工程では、印刷／被覆が施されたばかりの基材が第１の印刷ユニットの圧胴と接触しているときに高速加熱空気を送風して基材に当てることを特徴とする請求項１８記載のオフセット輪転印刷方法。

【請求項２０】　印刷基材を第１の印刷ユニットから中間渡し胴に移送し、印刷基材が中間渡し胴と接触しているときに印刷基材を乾燥させることを特徴と

する請求項１８記載のオフセット輪転印刷方法。

【請求項２１】　印刷／被覆が施されたばかりの基材が圧胴と接触しているときに基材上の暴露域から高温空気、水分及び揮発分を除去することを特徴とする請求項１８記載のオフセット輪転印刷方法。

【請求項２２】　水性コーティング材料又は紫外線硬化性コーティング材料のプライマーコーティングを第１の印刷ユニット内で基材に施し、基材が第２の印刷ユニット内で処理される前に、基材上のプライマーコーティングを乾燥させることを特徴とする請求項１８記載のオフセット輪転印刷方法。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】

本発明は、枚葉紙又は巻取紙オフセット輪転又はフレキソ印刷機に関し、特に、印刷インキ又は保護若しくは装飾用コーティングを枚葉紙（シート紙）基材又は巻取紙基材にインライン方式で付着させる新規且つ改良型のインキング／コーティング装置に関する。

【０００２】

【従来の技術及び発明が解決しようとする課題】

従来型枚葉紙オフセット輪転印刷機は典型的には、一又は二以上の印刷ユニットを含み、これら印刷ユニットを通して個々の枚葉紙を送り、濡れたインキで印刷する。オフセット輪転印刷機で用いられるインキは代表的には、印刷後しばらくは濡れてくっつく状態のままなので、印刷されたばかりの枚葉紙（以下、「印刷枚葉紙」ともいう）を或る一つの印刷ユニットから別の印刷ユニットに移送しているときや枚葉紙デリバリースタッカに搬送しているときに、印刷枚葉紙にマークや汚れが付かないようにするために特別の予防策を講じる必要がある。印刷枚葉紙の印刷面は比較的ゆっくりと乾燥し、次に行われる印刷ユニット間の移送中に汚れの付く場合がある。汚れ付着及び裏移りを減少させるために、スプレーパウダが印刷枚葉紙に施される。

【０００３】

印刷用途によっては、保護及び／又は装飾用コーティングを印刷されたばかり

の枚葉紙の全面又は一部に施すことにより裏移り及び汚れ付着を防止する。保護又は装飾用コーティングを施すための種々の構成が、印刷機の最後の印刷ユニットをコーティング付着ユニットとして用いることによりインライン方式として提案された。しかしながら、かかるインライン方式のコーティングを施す場合、最後の印刷ユニットを、インキを枚葉紙に付着させるのに使用することはできず、コーティング作業にしか利用することができない。かくして、これらの形式のインライン型コーティング装置を用いてコーティングを行っている間、最後の印刷ユニットはコーティングユニットになるので、印刷機はその全ての色の印刷を行うことが出来ない。

【０００４】

印刷機をコーティング又は非コーティングを行うよう再構成するのに必要な時間は非生産的であってコストがかかることは理解されよう。したがって、一回の印刷作業を終えて掃除し、次の仕事をセットアップして運転する時間を最小限に抑えるインライン型コーティング装置（塗工機）が要望されている。連続的な仕事において同一タイプのコーティング、特にブランケットによるコーティングが必要とされる場合、仕事と仕事の間で塗工機を掃除する必要はない。しかしながら、コーティング材料がローラ上で乾燥するようになることはない。したがって、特にブランケットからスポットコーティングへの、或いはこの逆の切換えの際、或いは、もし仕事と仕事の間に遅れがあれば、各仕事を完了させる度に塗工機を洗浄することが必要である。

【０００５】

加えて、異なるコーティング組成物の間、例えば水性コーティングと紫外線硬化性コーティングの間で切り換える際、塗工機の洗浄が必要である。かかるコーティング材料は互換性がなく、その結果、異なるコーティング媒体の付着にあたり塗工機を洗浄しなければならない。

【０００６】

【課題を解決するための手段】

本発明によれば、上記の欠点は、インキング／コーティング作動位置と引込みオーバーヘッド遊び位置との間でフェリスホイール回動運動（Ferris wheel mov

ement)を行うよう印刷ユニットに取り付けられた引込み自在なインライン型インキング／コーティング装置により解決される。インキング／コーティング装置は、片持ち支持アームを含むキャリジ組立体により版胴又はゴム胴のいずれかと整列して位置決めされるアプリケータヘッドを含む。支持アームは、インキング／コーティングヘッドと印刷ユニットタワー部との間に回動自在に結合される。この片持ち方式の回動取付け構造により、インキング／コーティングユニットを２つの印刷ユニット間で使用できるだけでなく、印刷機の最後の印刷ユニットについても使用できる。

【０００７】

好ましい実施例では、アプリケータヘッドは、垂直方向に間隔を置いて位置した対をなすクレードル部材を含み、キャリジ組立体が作動位置になるとき、一方のクレードル対は、金属又はセラミックコーティングローラをゴム胴と整列した状態に支持し、他方のクレードル対は、弾性アニロックスコーティングローラを版胴と整列した状態に支持するようになっている。支持アームにより片持ち方式回動支持手段が構成されるので、アプリケータヘッドを、隣り合う印刷ユニット間の限定されたスペース内において、フェリスホイール運動と類似した形態で円弧を描いて昇降させることができる。完全引込み状態では、アプリケータヘッド及びキャリジ組立体は、高い引込みオーバーヘッド位置、好ましくは印刷ユニットタワー部の上に位置するオーバーヘッド位置まで持ち上げられ、かくして印刷ユニットの印刷能力を失わせないで、インターステーション空間及び印刷ユニットの胴へょ完全な接近を得ることができる。アプリケータヘッドのインキング／コーティングアプリケータローラの点検、クリーニング又は交換をすることができ、また、インキング／コーティング装置が引込み位置にあるときに、ドクターブレード組立体の洗浄を自動的に行うことができる。

【０００８】

インキング／コーティング装置をフレキソ印刷版及び水性インキ又は水性コーティングと組み合わせて用いると、印刷されたばかりの枚葉紙上の水性インキ又はコーティングの水成分は、高速高温空気インターステーション乾燥装置及び大容量熱及び水分エキストラクタ（除去又は抽出装置）組立体によって蒸発し、印

刷直後のインキ又はコーティングは、枚葉紙が次の印刷ユニットで印刷される前に、完全に乾くようになる。この迅速なフレキソ印刷／コーティング乾燥構成により、インキのベースコート、例えばオペークホワイト又は金属粉インキ（金、銀その他の金属類）を第１の印刷ユニットで付着させ、そして次の印刷ユニットで平版印刷法でオーバープリントすることができる。

【０００９】

【発明の実施の形態】

本明細書で用いる「処理（された）」という用語は、基材のいずれか一方の面に施される種々の印刷プロセスを言い、かかる印刷プロセスは、紫外線硬化性で水性のインキ及び／又はコーティング（被膜）の付着を含む。「基材」という用語は、枚葉紙（シート紙）又は巻取紙を差す。また、本明細書では、「乾式印刷版（waterless printing plate）」という用語は、疎油性の非画線部及び親油性の画線部を備えた印刷版を意味し、非画線部は、水性インキの表面張力よりも小さな表面張力値を有し、画線部は、水性インキの表面張力よりも大きな表面聴力値を備えていることを特徴とする。「フレキソ」という用語は、水性インキ又は水性コーティング材料で濡らすことができるレリーフ面（凸版面）を備えた可撓性の印刷版を意味する。

【００１０】

例示の図面に示すように、本発明は、全体を符号１２で示している枚葉紙又は巻取紙オフセット輪転又はフレキソ印刷機で印刷された枚葉紙又は巻取紙にインキ又は保護及び／又は装飾用コーティングを施すための新規且つ改良型のインライン型インキング／コーティング装置１０に具体化されている。この場合、図１に示すように、インキング／コーティング装置１０は、「ハイデルベルグ・スピードマスター（Heiderberg Speedmaster 102V)」という商品名でドイツ国のハイデルベルガー・ドルクマシーネン・アクチェンゲゼルシャフトによって製造されているような４色印刷機１２内に設置されている。印刷機１２は、右側の端部が符号Ｓで示されている枚葉紙を一枚ずつ次々に印刷機内に送り込む給紙装置１６に、反対側の端部が印刷されたばかりの枚葉紙を集めて積み重ねるデリバリー（排紙装置）スタッカ２０にそれぞれ結合した機枠又はフレーム１４を含む。給紙

装置１６とデリバリースタッカ２０との間には、４つの実質的に同一の輪転印刷ユニット２２，２４，２６，２８が設けられており、これら印刷ユニットは、枚葉紙が印刷機内を通って移動しているときに枚葉紙上に異なる色のインキを印刷することができる。印刷ユニットは、サイドフレーム部材１４，１５によって形成される印刷タワー部Ｔ１，Ｔ２，Ｔ３，Ｔ４内に納められている。

【００１１】

図示のように、印刷ユニット２２，２４，２６，２８は実質的に同一であって従来設計のものである。第１の印刷ユニット２２は、インフィード渡し胴３０、版胴３２、ゴム胴３４及び圧胴３６を含み、これらは印刷機のサイドフレーム１４，１５間に互いに平行な整列状態で回転自在に支持されている。最初の３つの印刷ユニット２２，２４，２６は各々、印刷枚葉紙を隣の圧胴からインターステーション渡し胴４０を経て次の印刷ユニットに送り渡すよう設けられたインターユニット渡し胴３８を有する。最後の印刷ユニット２８は、印刷枚葉紙１８を最後の圧胴３６からデリバリーコンベヤシステムに移送する際に各印刷枚葉紙１８を枚葉紙デリバリースタッカ２０に案内するデリバリー紙取り胴４２を備えた状態で示されている。

【００１２】

図２に示されているようなデリバリーコンベヤシステム４４は、従来設計のものであって、印刷されたばかりの枚葉紙１８が最後の印刷ユニット２８の紙取り胴４２と圧胴３６との間のニップを出た後、その前縁を加えるためのクリッパ（加え爪）を有する横方向に配置されたグリッパ棒を備える一対の無端デリバリーグリッパチェーン４６を有する。印刷シート紙の前縁がグリッパによって把持されると、デリバリーチェーン４６は、枚葉紙を圧胴３６から引き離し、そして印刷枚葉紙を枚葉紙デリバリースタッカ２０に搬送する。

【００１３】

印刷されたばかりであると共に、或いはコーティングが施されたばかりの枚葉紙Ｓは、デリバリー枚葉紙スタッカに到達する前に、デリバリー乾燥装置４８の下を通過し、このデリバリー乾燥装置４８は、赤外線熱放射と高温高速空気流と熱及び水分除去方式との組合わせである。

【００１４】

図１に示す例示の形態では、第１の印刷ユニット２２は、フレキソ印刷版を備えていて、インキングローラ列又はダンプニング装置を必要としない。もしインキングローラ列が第１の印刷ユニットに取り付けられている場合、インキ着け（フォーム）ローラは、印刷ユニットが刷りを行うと引っ込められてオフ状態にロックされる。フレキソ水性インキは、インキング／コーティングユニット１１０によって供給される。残りの印刷ユニット２４，２６，２８は、平版印刷できるように装備されており、これら印刷ユニットはインキをインキ壷５４から版胴３２に移すよう配置されたインキングローラ列５２を備えたインキング装置５０を含む。これは、インキ出しローラ５６及び壷ローラによって達成される。インキ出しローラ５６はインキ壷５４内に突出し、その表面は印刷インキＱで濡れる。印刷インキＱは壷ローラによって間欠的にインキングローラ列５２に移される。インキングローラ列５２は印刷インキＱを版胴３２の印刷版Ｐの画線部に供給する。

【００１５】

印刷インキＱは、印刷版から、ゴム胴３４に取り付けられているインキ受容ブランケットＢに転移される。ブランケットＢ上に担持されたインキ付き画線は、枚葉紙が圧胴３６とブランケットＢとの間のニップ中に移送されると枚葉紙Ｓに転移される。

【００１６】

図１に示すインキングローラ装置５２は、平版（lithographic）インキ印刷版と組合わせて用いる場合の例示である。ダンプニングローラ（図示せず）は平版Ｐに直接係合するが、印刷ユニット２２のフレキソ版と併用されないことは理解されよう。

【００１７】

次に、図４、図５、図６を参照すると、インライン型インキング／コーティング装置１０は、アプリケータヘッド６０を支持するキャリジ組立体５８を含む。アプリケータヘッド６０は、油圧モータ６２、下部歯車列６４、上部歯車列６５、アプリケータローラ６６及びドクターブレード組立体６８を含む。アプリケー

タローラ６６の外周面はリザーバ７０に入っている液体コーティング材料又はインキと直接接触して濡れるよう挿入される。リザーバ７０には、インキ又はコーティング材料が連続的に供給され、このインキ又はコーティング材料はリザーバ７０を通ってポンプ（図示せず）によって印刷機外部に設けられた源から循環される。油圧モータ６２は印刷機駆動装置（図示せず）からのＲＰＭ制御信号及びタコメータ７２によって生じるフィードバック信号に応答して版胴３２及びゴム胴３４と同期してアプリケータローラ６６を駆動する。油圧駆動モータが好ましいが、電気駆動モータを使用してもよい。

【００１８】

アプリケータローラ６６は好ましくは、測定した量の印刷インキ又はコーティング材料を印刷版又はブランケット上に転移させる流量測定アニロックスローラである。アニロックスローラの表面には、「セル」と称する列状の密に間隔をおいた浅い窪みが彫刻により設けられている。リザーバ７０からのインキ又はコーティング材料は、アニロックスローラがリザーバ中を回転するとセル内に流れ込む。アニロックスローラの転移面はドクターブレード７３によって、過剰のインキ又はコーティング材料がかき落とされる。アニロックスローラ上に残っているインキ又はコーティング材料は、セル内に入る所定の測定量である。

【００１９】

アプリケータローラ６６は円筒形であり、種々のサイズ及び形状のセルを含む種々の直径及び長さで構成できる。アニロックスローラの体積容量は、製造中に決められ、セルのサイズ、形状及び単位面積当たりのセルの数の選択に応じて決まる。意図した用途に応じて、セルパターンは、細かくても（単位面積当たり多くの小さなセル）又は粗くても（単位面積当たり少ない数の大きなセル）よい。

インキ又はコーティング材料をインキング／コーティングアプリケータヘッド６０を介して付着又は塗布することにより、平版印刷ユニットのインキングローラ列と比較して、より多くの量のインキ又はコーティング材料を枚葉紙Ｓに与えることができる。さらに、色の純度が高くて一層輝きがある。というのは、フレキソインキは、平版印刷法によって得ることができる塗り厚よりもはるかに厚い

塗り厚で塗布され、湿し溶液によって稀釈されることはないからである。

【００２０】

インキング／コーティングアプリケータヘッド６０は、アプリケータローラ６６、歯車列６４、歯車列６５、ドクターブレード組立体６８及び駆動モータ６２を支持するサイドフレーム部材７４，７６を含む。アプリケータローラ６６は、両端部が一対のエンドプレート７８，８０によって形成される下方クレードル上に支持され、これらエンドプレート７８，８０はアプリケータローラ６６をゴム胴３４と平行な整列関係に保持している（図５）。また、サイドフレーム７４，７６は、下方サイドプレート７８，８０に関して垂直方向に間隔をおいて設けられた一対のサイドプレート８２，８４によって形成される上方クレードルを備えている。各クレードルは、アプリケータローラ６６を、版胴３２に取り付けられた版Ｐ（図４）又はゴム胴３４に取り付けられたブランケットＢに密着してスポット状態のコーティング又はインキングを行うことができるよう保持するための一対のソケット７９，８１及び８３，８５をそれぞれ有している。

【００２１】

好ましくは、上方クレードル（プレート）位置についてのアプリケータローラ６６は、弾性転移面を備えたアニロックスローラである。デュアルクレードル構成では、印刷機のオペレータは、最少限の印刷機の運転停止時間でブランケットのインキング／コーティング及び版のインキング及びコーティングから素早く切り換えることができる。というのは、もしインキからコーティング材料へ、或いはその逆にしようとする場合、必要なことは、アプリケータローラ６６を取り外して再位置決めし、又はこれを交換し、そしてドクターブレード組立体を洗浄することだけである。フレキソモード又は平版モードのいずれかで選択的に動作し、版又はブランケット位置のいずれか一方から印刷又は被覆を行うことができることを本明細書では「リソフレックス（LITHOFLEX ）」法と呼ぶ。

【００２２】

再び図２及び図３を参照すると、アプリケータヘッド６０はキャリジ組立体５８によって片持ち回動方式で支持され、この片持ち回動構成により、デュアルクレードル型インキング／コーティング装置１０及び単一クレードル型インキング

／コーティング装置１１０を、任意の２つの隣り合う印刷ユニット間で用いることができるだけでなく、印刷機の最初と最後のユニットについて使用することもできる。これを可能にするのは、ピボットシャフト７７でサイドプレート又はサイドフレーム部材７４，７６に回動自在に結合された一対の片持ち支持アーム８８，９０である。各支持アームはハブ部分８８Ａ，９０Ａ及び細長いシャンク部分８８Ｂ，９０Ｂを有する。

【００２３】

片持ち支持アームは、ピボットブロック９２，９４によって印刷タワー部に回動自在に取り付けられている。ハブ部分８８Ａ，９０Ａは、ピボットシャフト９６，９８で回転自在に支承されている。ピボットブロック９２，９４はタワー部１４Ｄに固定されていて、キャリジ組立体５８は片持ちフェリス（Ferris）支持方式でピボットシャフト９６，９８から回動自在に吊り下げられるようになっている。シャンク部分８８Ｂ，９０Ｂはピボットシャフト７７に回動自在に結合されていて、キャリジ組立体５８及びアプリケータヘッド６０は、互いに且つピボットシャフト７７に対して独立して回転をすることができるようになっている。この構成では、アプリケータヘッド６０はピボットシャフト７７から回動自在に吊り下げられ、支持アームが作動位置から完全引っ込み位置へ、或いはその逆方向に回転する間、直立の向きを保つ。

【００２４】

かくして、クレードル７８，８０，８２，８４は、アプリケータヘッドが例えば図４及び図５に示すように作動位置に伸長されると、アプリケータローラ６６を版胴又はゴム胴と垂直且つ水平な整列関係をなすよう位置決めする。さらに、支持アームのハブ部分とシャンク部分が互いに横方向に位置する関係にあるので、アプリケータヘッド６０及びキャリジ組立体５８は、隣り合う隣接の印刷タワー部に触れることなく、フェリス動作の回転円弧運動を行うことができる。これにより、インキング／コーティング装置１０を任意の中間の印刷ユニットタワー部（Ｔ２，Ｔ３）だけではなく、最初の印刷ユニットタワー部Ｔ１及び最後の印刷ユニットタワー部Ｔ４にも設置することができる。そのうえ、インキング／コーティングユニット１０が作動位置にある時、印刷ユニット間のインターステー

ション空間内へのアプリケータヘッド６０の横方向の突出の度合が最少限に抑えられる。これにより、アプリケータヘッドが作動位置になっているとき、オペレータが事実上制約を受けないで、隣り合う印刷ユニット間のインターステーション空間に接近することができ、またキャリジ組立体５８が引っ込められている状態では全く制約のない接近が可能となる。

【００２５】

キャリジ組立体５８の回転の向きは、引込み不作動（遊び）位置（図１に想像線で示す）から作動位置（図４及び図５）へ反時計回りである。キャリジ組立体５８は、版及びブランケットへの接近がダンプニング装置のローラ等によって制限されないと仮定すれば、引込み位置から作動位置へ時計回りに回転してアプリケータローラをタワー部のダンプニング装置側の版又はブランケットのいずれかに係合させることができるよう改造が可能である。

【００２６】

支持アーム８８，９０は、ピボットブロック９２，９４に対して同時に回転するよう支持アームに固定されたバランスウェイト１００，１０２によって回転動作しやすくなる。動力を用いず、バランスウェイトを用いて回転しやすくする構成になっているので、印刷機のオペレータはインキング／コーティング組立体１０を図４に示すような係合動作位置から図１に想像線で示すような完全引っ込み不作動位置に容易に移動させることができる。好ましくは、キャリジ組立体５８は、ねじりバネ、電気モータ又は油圧モータを用いると、回転しやすくなる。

【００２７】

インキング／コーティング装置１０は、支持アーム８８，９０を印刷ユニットタワー部Ｔ４の印刷機のサイドフレーム１４，１５にそれぞれ作動位置で固定する開放自在なラッチカップリング１０３，１０５によって図４に示すように作動位置に解除自在に係止される。ゴム胴３４へのアプリケータローラ６６のコーティング動作での係合は、動力アクチュエータ、好ましくは伸縮自在な動力伝達アーム１０４Ａ，１０６Ａを備えた空気圧シリンダ１０４，１０６によってもたらされる。空気圧シリンダ１０４はピボット式リンク装置１０８によって支持アーム８８に回動自在に結合され、第２の空気圧シリンダ１０６はピボット式リンク

装置１０９によって支持アーム９０に回動自在に結合されている。空気圧シリンダ１０４，１０６の作動に応答して、動力伝達アームは引っ込められる。動力伝達アームが引っ込むと、インキング／コーティングヘッド６０はピボットシャフト７７を中心として反時計回りに回転し、かくしてアプリケータローラ６６をゴム胴３４にコーティングのために係合させる。

【００２８】

ピボット式リンク装置１０８は、ピン１１３で回動運動自在に取り付けられたベルクランク１１１を含む。ピン１１３は、支持アーム８８に取り付けられたクレビスプレート１１５によって支持される。ベルクランクの一端はアクチュエータアーム１０４Ａに回動自在に結合され、カムローラ１１７がその反対側の端部に回転自在に取り付けられている。

【００２９】

カムローラ１１７は、サイドプレート７４にしっかりと固定されている可調式のストップ又は停止部材１１９に係合できる。ハンドルHを反時計回りにシフトさせることにより、カムフォロア１２１は、カムローラ１１７がインターロック作動位置で可調式停止部材１１９に係合すると、レシーバブロック１２５のラッチポケット１２３内に入る。図４、図５及び図６を参照すると、レシーバブロック１２５は、止めネジによって印刷ユニットタワー部のデリバリー側に固定されている。

【００３０】

版Ｐが刷りを行うと、動力が空気圧アクチュエータ１０４に及ぼされ、動力伝達アーム１０４Ａが引っ込み、かくしてベルクランク１１０がピン１１３の回りに反時計方向に回転する。空気圧アクチュエータ１０４によって及ぼされたトルクは、カムローラ１１７及び可調式停止部材１１９を介してアプリケータヘッド６０に伝達される。支持シャフト７７に対するアプリケータヘッド６０の反時計回りの動作により、アプリケータローラ６６は版Ｐと係合するようになる。

【００３１】

可調式停止部材１１９は、カムローラ１１７と係合できる螺設ボルト１１９Ａを有する。打撃係合点はあらかじめ設定されていて、アプリケータローラ６６は

、アプリケータヘッド６０が印刷機フレーム１４とインターロックすると共に印刷ユニットが刷りを行うと、作動位置にある版Ｐ又はブランケットＢと係合するよう正しく位置決めされるようになる。

【００３２】

図５を参照すると、単一のヘッドを備えたインキング／コーティング装置１１０が示されている。この変形例の構成は、デュアルヘッド構成に関する全ての点において同一であり、異なるところは単一の歯車列及びアプリケータローラを保持するための単一のクレードルしか用いられていないことである。両方の実施例において、インキング／コーティングヘッド６０は、フェリスホイールの動作と比べて円弧を描いて揺動しているとき直立の状態を保つ。インキング／コーティングヘッド６０は伸長位置と引込み位置との間で動いているときに直立に向くので、印刷ユニットタワー部間の通常のプラットホーム間隔により、キャリジ組立体５８の伸縮を可能にする適当な隙間が得られ、この場合オペレータによる印刷ユニットへの接近を妨害しない。このことは、インライン型インキング／コーティング装置１０が任意の隣り合う印刷ユニット間のインターステーション空間内で有効に動作し、インキング／コーティング装置が引込み位置（図１に想像線で示す）にあるとき、印刷ユニットの各種胴への接近を妨害しないという点において著しい利点を奏する。

【００３３】

さらに、インライン型インキング／コーティング装置が完全引込み位置にある時、アプリケータローラ６６は有利には、印刷ユニットのダンピング装置側に位置決めされ、点検、掃除又は交換が可能となる。その上、ドクターブレード組立体は又、有利には、点検、取外し、調整又は掃除のために位置決めされる。また、ドクターブレードリザーバ及びコーティング循環ラインは、印刷機の運転中に、且つ印刷機が一種類のインキまたはコーティング材料から別のタイプに切り換えるために運転停止しているときにクリーニングが可能となる。

【００３４】

インキング／コーティング装置が水性インキまたは水性コーティング材料を付けるのに用いられる場合、印刷されたばかりの枚葉紙Ｓ上の水分は、図１、図４

及び図５に示すような高速高温空気インターステーション乾燥装置と大容量熱及び水分エキストラクタ（extractor)から成るユニット１１２，１１４によって蒸発させられる。乾燥装置／エキストラクタユニット１１２，１１４は、印刷及びコーティングが施されたばかりの枚葉紙がインターユニット渡し胴３６及び中間渡し胴４０によって移送されているとき、高速加熱空気を枚葉紙上に当てるよう差し向けられている。この構成により、印刷されたばかりの水性インキ又はコーティング材料は、枚葉紙が次の印刷ユニット内でオーバープリント又は重ね刷りをされる前に完全に乾く。

【００３５】

高速高温空気乾燥装置と高性能熱及び水分エキストラクタのユニット１１２，１１４は、各印刷枚葉紙の表面にくっついている湿り空気層を粉砕して飛び散らす高速空気ジェットを利用する。各乾燥装置内では、高速空気は、空気デリバリーバッフル管内の抵抗加熱要素を横切って流れるときに高温に加熱される。高温空気の高速ジェットは、印刷及びコーティングが施されたばかりの枚葉紙Ｓが渡し胴３６及び中間渡し胴４０によって移送されているときに、暴露域Ｚ（図４及び図５）の多数の空気流通穴を通って送りだされて印刷及びコーティングが施されたばかりの枚葉紙Ｓに当てられる。各乾燥装置組立体は、図４及び図５に示すように互いに間隔をおいて並置関係にある一対の空気デリバリー乾燥装置ヘッドを含む。

【００３６】

印刷されたばかりの枚葉紙の各々から取り除かれた高速高温の水分含有空気は、大容量エキストラクタによって乾燥機の暴露域Ｚから抽出され、そして印刷ユニットから完全に排出される。各エキストラクタヘッドは、乾燥装置ヘッドに結合されたマニホルドを含み、水分、揮発分及び高速高温空気を乾燥装置ヘッド間の長さ方向隙間を通して引き出す。この構成によれば、各印刷枚葉紙は、次の印刷ユニットを通して移動する前に乾燥させられる。

【００３７】

フレキソ印刷で用いられる水性インキは、インターステーション高速高温空気乾燥装置／エキストラクタ１１２，１１４によって得られる比較的適度な乾燥温

度で乾燥する。その結果、印刷の品質は実質的に改善される。というのは、水性インキは次の印刷ユニットに入る前に印刷ユニットごとに乾燥するからである。さらに、次の印刷ユニットのブランケット上でのバックトラッピング（back-trapping)が完全に無くなる。このインターステーション乾燥構成により、水性インキ、例えば金属粉インキ及びオペークホワイトインキを一つの印刷ユニットでプリントでき、そして次の印刷ユニットでオーバープライント又は重ね刷り処理を行うことができる。

【００３８】

また、この構成により、第１の印刷ユニットを、水性コーティングを低品質の紙、例えば再生紙に施すコーター（塗工機）として使用でき、またダスト、スプレーパウダー及び他のデブリをインラインで捕捉してシールし、次の印刷ユニットでオーバープリントできる一層平滑で丈夫な表面を得ることができるファーストダウンコーティング（first down coating）は、低品質で粗い基材の表面をシールし、裏抜け（ストライクスルー）及び透き通し（ショースルー）を防止しながらオーバープリントされたドットの鮮明度又はデフィニション（definition）を改善する。紫外線硬化性の保護及び／又は装飾用コーティングを最後の印刷ユニット内でファーストダウンオーバープリントされた（水性）コーティングの上に施すことができる。

【００３９】

好ましくは、アプリケータローラ６６はコーティング材料をゴム胴３４上のブランケットＢに付着させるのに用いられる場合、金属又はセラミックで構成される。アプリケータローラ６６を版に適用する場合、好ましくはこれはフレキソ印刷版に係合する弾性移送面を備えたアニロックスローラとして構成される。適当な弾性ローラ表面材料として、Buna N形合成ゴム及びＥＰＤＭ（ターポリマーエラストマー）がある。

【００４０】

インキング／コーティング装置１０は、広範な種々のインキを付着させることができることが理解されよう。このインキは、蛍光剤（Day Glo ）、パールエッセンス、金属粉類（金、銀その他の金属）、光輝顔料又は光沢剤、スクラッチア

ンドスニッフ（scratch and sniff）（マイクロカプセル化された芳香剤）、スクラッチアンドレビール（scratch and reveal）、発光顔料、感圧接着剤等を含む。

【００４１】

印刷機のオペレータは、ダンプニング装置のローラ組立体を完全に不要にすることができ、インキング／コーティング装置１０は、水性インキ及びコーティングをフレキソ又は乾式印刷版及びブランケットに選択的に付着させることができる。さらに、水性インキ及びコーティングのオーバープリントを、次の印刷ユニットで実施することができる。というのは、水性インキ及びコーティングは、高速高温空気インターステーション乾燥装置及び大容量熱及び水分エキストラクタ組立体によって完全に乾くからである。

【００４２】

本発明で用いるような水性インキ及びコーティングは、着色顔料及び／又は可溶性染料、着色顔料を印刷枚葉紙の表面上に固定する結合剤、ワックス、脱泡剤及び増粘剤を含有する。水性印刷インキの含有主成分は、溶剤、希釈剤及び／又はビヒクルとしての水である。好ましい増粘剤は、アルゴネート類（algonates）、スターチ、セルロース及びその誘導体、例えばセルロースエステル又はセルロースエーテル等を含む。有機物だけではなく無機物顔料を含む着色剤を、水に溶けない染料から誘導してもよい。また、印刷インキは水を含んでも良いが、主成分としてグリコール等を含み、顔料は適当な樹脂で結合される。金属粉インキを印刷する場合、アニロックスローラのセルを適当に寸法決めして金属粒子がセル内で不動状態になるのを阻止する必要がある。セルのサイズは重要であり、金属の金粉のインキについては、アニロックスローラは、１インチ当たり１７５～３００本のライン（１ｃｍ当たり６９～１１８本の範囲）のスクリーンラインカウント（screen line count）を有する必要がある。

【００４３】

インキング／コーティング装置１０はまた、紫外線硬化性インキ及びコーティングを施すことができる。もし紫外線硬化性インキ及びコーティングを利用する場合、紫外線乾燥装置／エキストラクタは、高速高温空気乾燥装置／エキストラ

クタユニット１１２，１１４に隣接して設置される。

【００４４】

本明細書で開示したインキング／コーティング装置１０により、印刷ユニットをフレキソ印刷モード又は平版印刷モードのいずれかで選択的に動作させることができると共に版又はブランケット位置のいずれかから印刷又はコーティングを行うことができる。本発明のデュアルクレードル支持構成により、ゴム胴位置のインキング／コーティングから版胴位置のインキング／コーティングまで最短の印刷機運転停止時間で素早く切り換えることができる。というのは、印刷／インキング装置が引込み位置にある状態で、アプリケータローラ６６を取り外して再位置決めし、又は交換する必要があるだけだからである。

【００４５】

さらに、印刷機のオペレータは、一作業で版から水性インキ／コーティングでスポット又はオーバーオール状態のコーティングを行い、そして次の作業でブランケットからスポット及び／又はオーバーオール状態のコーティングを行うよう段取りをつけることができる。ドクターブレード組立体を素早くフラッシして洗浄することができると共にアプリケータローラを素早く交換することができるので、最初の印刷機の運転中に版位置又はブランケット位置から水性インキ又はコーティングでスポット状態又はオーバーオール状態のコーティングを行い、次に次の印刷機の運転中に版位置又はブランケット位置から紫外線硬化性インキ又はコーティングでスポット状態又はオーバーオール状態のコーティングを行うことができる。インキング／コーティング装置１０は引込み位置にあって完全に離れて邪魔にならないところに位置しており、したがってドクターブレードリザーバ及び供給ラインを、印刷ユニットが別の仕事の印刷を行っている間に自動洗浄機器によってフラッシして洗浄することができる。

【００４６】

版及びブランケットに対するアプリケータローラヘッド及びローラ組立体の位置決めは、所定のあらかじめ設定された刷り位置に引込み自在である。その結果、印刷ユニットの調整又は変更は不要である。ただし、異なる種類のインキ又はコーティング材料を使うようドクターブレード組立体をフラッシしてアプリケー

タローラ６６をクリーニングし又は交換することが必要である。例示の実施例と関連して手動の伸縮操作を説明したが、作動位置への伸長及び不作動遊び位置への引っ込みを、油圧モータサーボ機構又は電気モータサーボ機構によって自動的に行うことができる。

【００４７】

フェリスホイール支持構造により、インキング／コーティング装置は印刷機の最初の印刷ユニット及び最後の印刷ユニットについてだけではなく、任意の隣合う印刷ユニット間のインターステーション空間内で効果的に作動することができ、この場合インターステーション空間を塞いだり遮ることなく又は印刷ユニットのうちの任意の胴へのオペレータの接近を制限することはない。

【００４８】

最後に、本発明のインキング／コーティング装置は印刷ユニットタワー部に取り付けられ、印刷ユニットの胴の調整又は変更を必要としないで作動位置に伸長できるので、印刷インキ又はコーティング材料を、枚葉紙オフセット輪転印刷機のゴム胴又は専用塗工ユニットのブランケットに付着させるのに用いることができる。

【００４９】

【図面の簡単な説明】

【図１】

本発明を具体化したインキング／コーティング装置を備えた枚葉紙オフセット輪転印刷機の概略側面図である。

【図２】

デュアルヘッド型インキング／コーティング装置が作動コーティング位置にあり、単一のヘッド塗工機が引込みオーバーヘッド位置にある図１の印刷機の斜視図である。

【図３】

作動位置にある図１の単一ヘッド型インキング／コーティング装置の一方の側を示す拡大簡略斜視図である。

【図４】

ブランケット位置からのスポット又はオーバーオール状態のコーティングのために作動コーティング位置にあるデュアルヘッド型インキング／コーティング装置を示す簡略側面図である。

【図５】

版位置からスポット又はオーバーオール状態のコーティングを施すために作動コーティング位置にある単一ヘッド型インキング／コーティング装置を示す簡略側面図である。

【図６】

油圧駆動組立体及びドクターブレード組立体を示す図４のデュアルヘッド型インキング／コーティング装置の部分切欠き簡略側面図である。

【符号の説明】

１０，１１０　インライン型インキング／コーティング装置
１２　枚葉紙又は巻取紙オフセット輪転又はフレキソ印刷機
２２，２４，２６，２８　印刷ユニット
３２　版胴
３４　ゴム胴
３６　圧胴
３８　インターユニット渡し胴
４０　インターステーション渡し胴
５２　インキングローラ装置
５８　キャリジ組立体
６０　アプリケータヘッド
６２　駆動モータ
６６　アプリケータローラ
６８　ドクターブレード組立体
７４，７６　サイドフレーム部材
７８，８０　クレードル
７９，８１　ソケット
８８，９０　片持ち支持アーム

１０４　空気圧シリンダ

１０８　ピボット式リンク装置

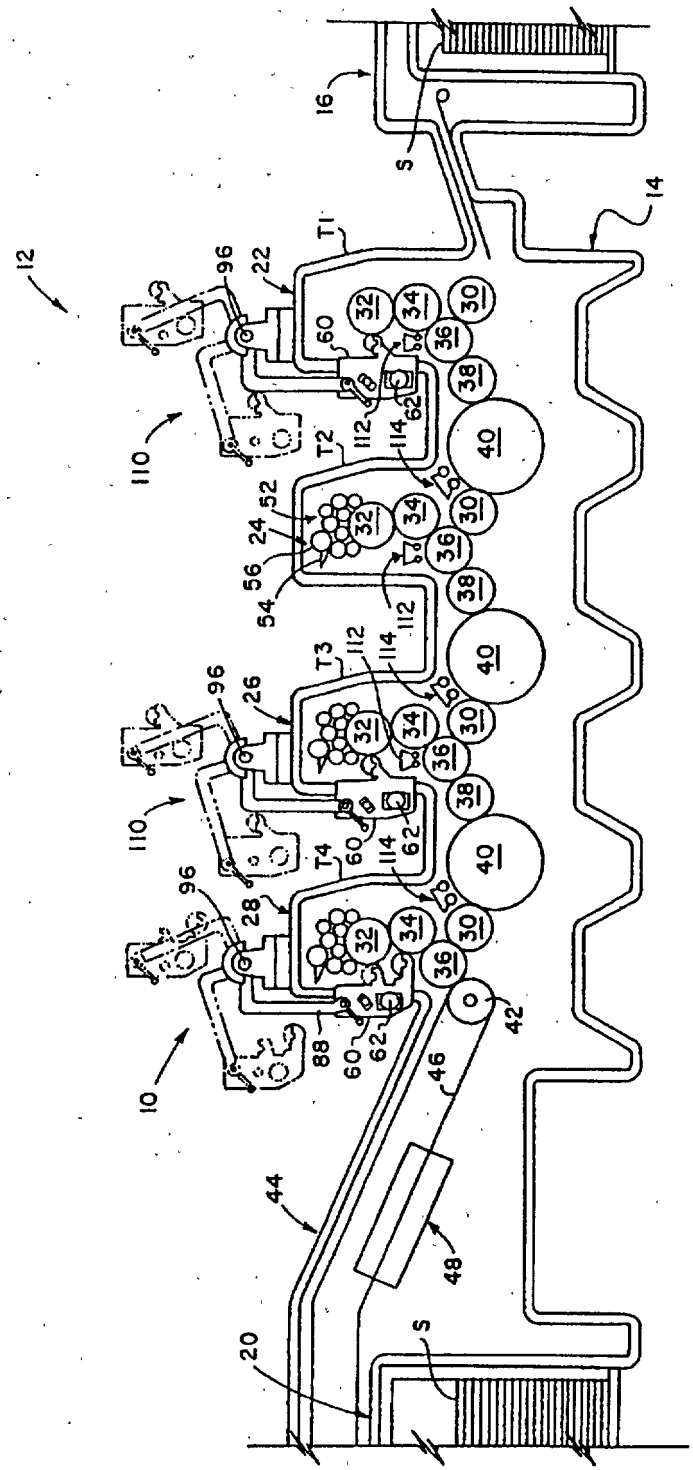
１１１　ベルクランク

１１２，１１４　乾燥装置／エキストラクタユニット

１１９　停止部材

【書類名】 図面

【図１】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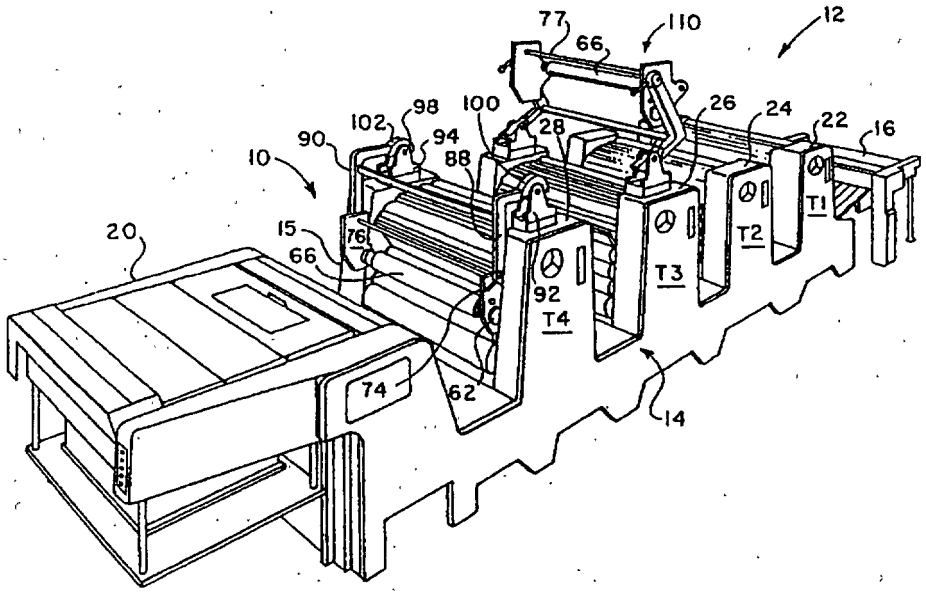
【図２】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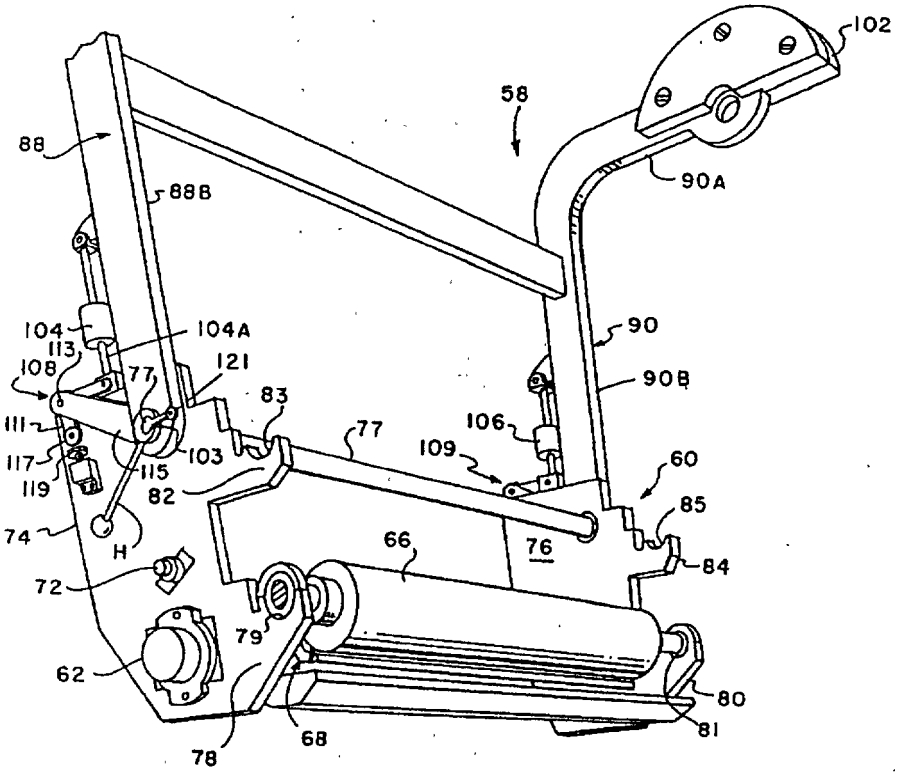
【図３】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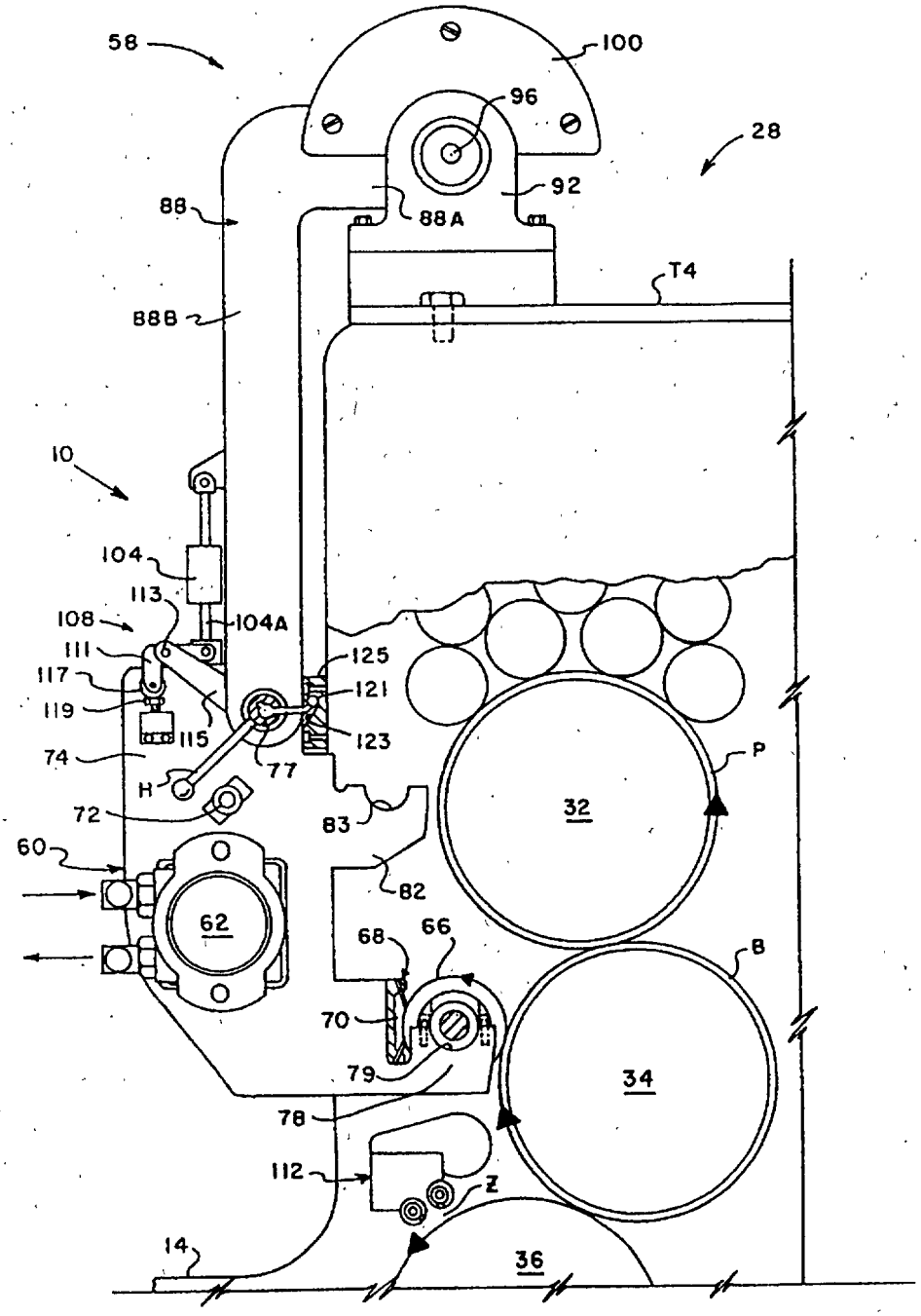
【図４】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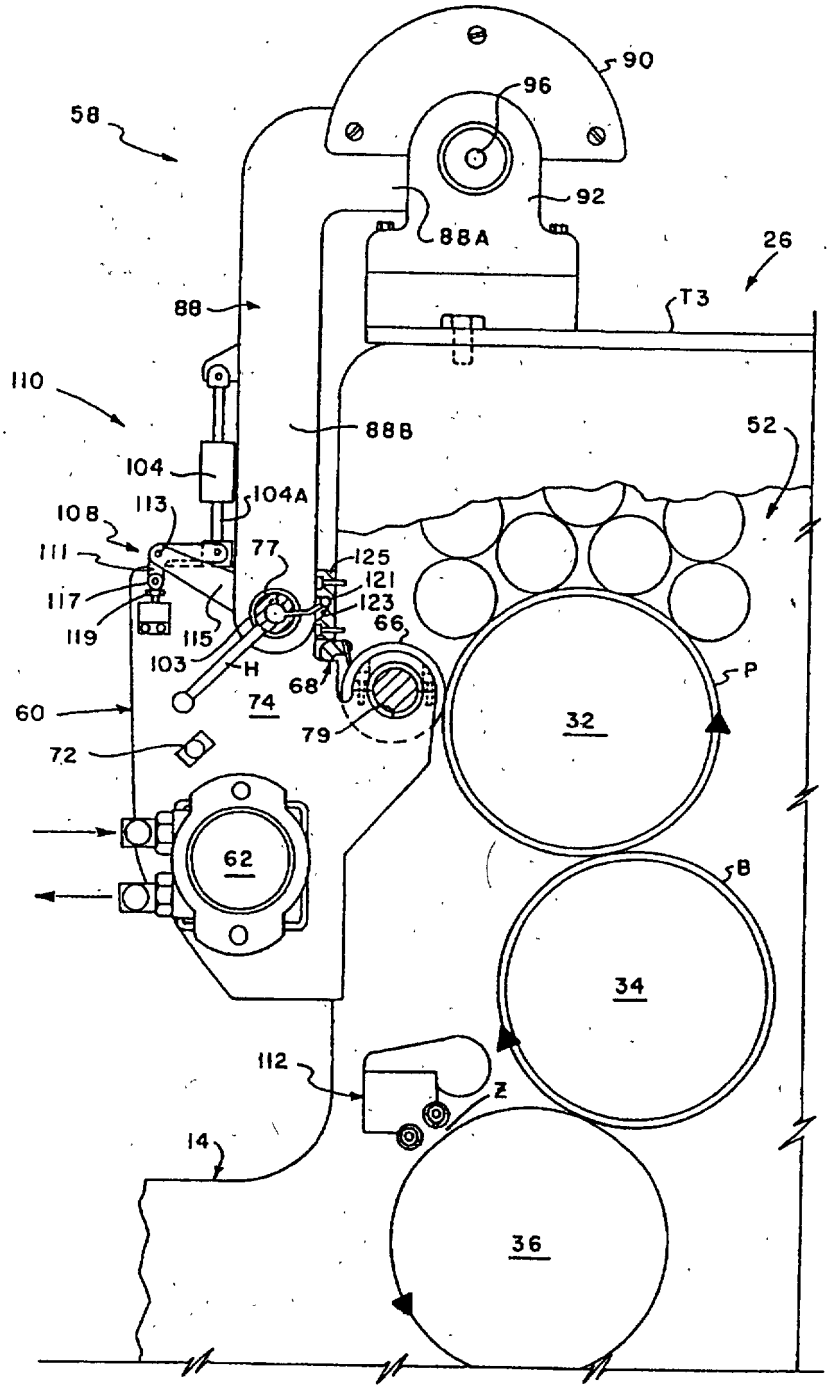
【図５】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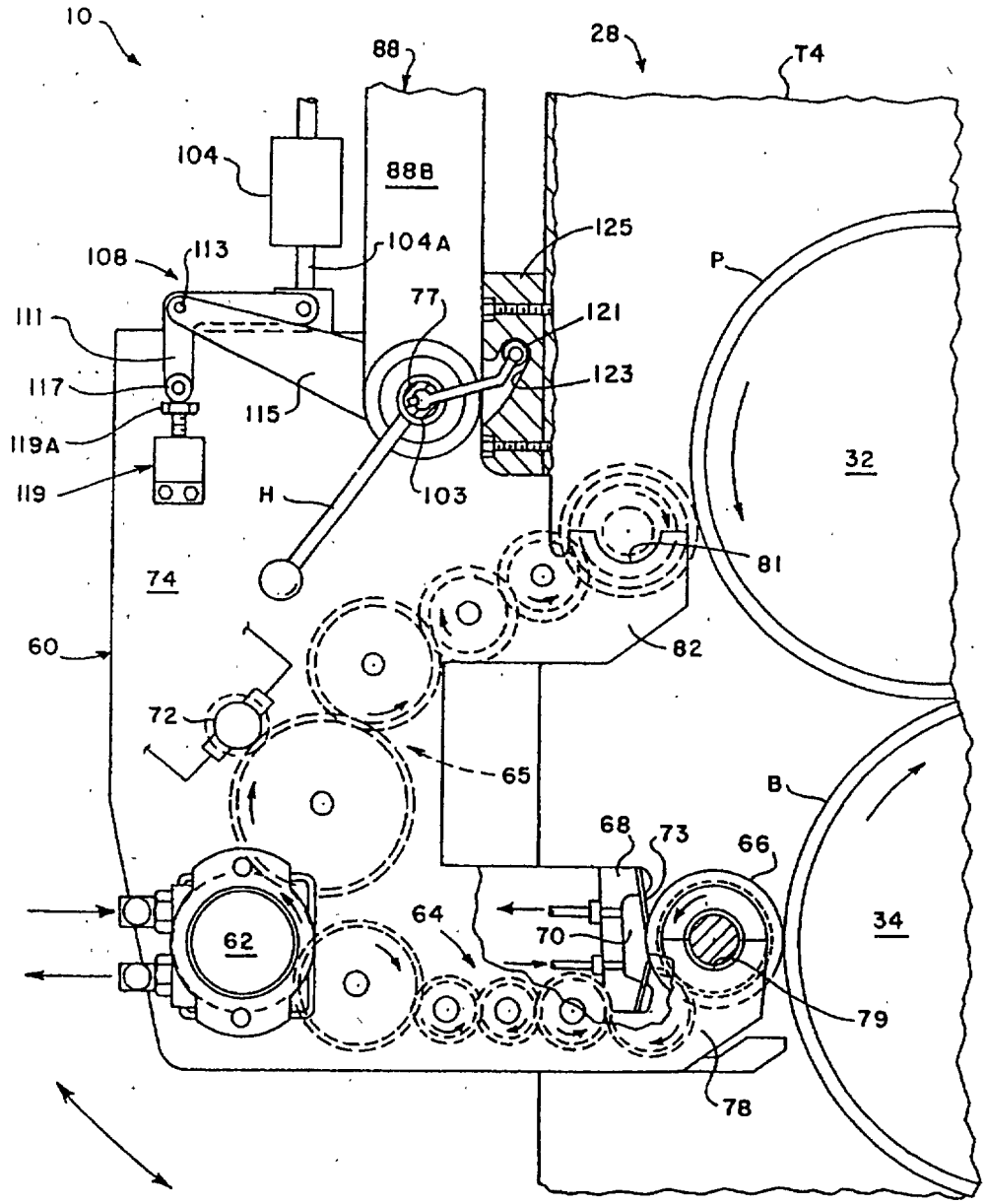
【図６】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【書類名】　要約書

【要約】

【課題】　オフセット輪転印刷機のゴム胴に取り付けたブランケット又はフレキソ版又は版胴に取り付けたフレキソ版に、インキ／コーティング材料をスポット又はオーバーオール状態のいずれかで選択的に付着させる引込み自在なインライン型インキング／コーティング装置を提供する。

【解決手段】　インキング／コーティング装置（10）は、印刷ユニット又は専用塗工ユニット（22 28 ）のタワー部に回動自在に取り付けられていて、印刷ユニットのタワー部に回動自在に結合されているキャリジ組立体により、インキング／コーティング位置に伸長したり、この位置から引っ込むことができる。回動支持手段として片持ち支持アームが用いられているので、インキング／コーティング装置は、隣り合う印刷ユニット間のフェリスホイール円弧運動で伸長したり引っ込んだりすることができる。

【選択図】　図１

拒絶理由通知書

特許出願の番号	平成　8年　特許願　第１４６３７１号	
起案日	平成１０年　6月１８日	
特許庁審査官	青木　和夫	７１１９　２Ｃ００
特許出願人代理人	加藤　紘一郎	（外　２名）殿
適用条文	第３６条	

この出願は、次の理由によって拒絶をすべきものである。これについて意見があれば、この通知書の発送の日から３か月以内に意見書を提出されたい。

理　由

１．　この出願は、特許請求の範囲の記載が下記の点で、特許法３６条第６項第１号に規定する要件を満たしていない。

記

請求項１に係る発明において、「インキ又はコーティング材料を、版胴に取り付けられた版又はゴム胴に取り付けられたブランケットに個別又は同時のいずれかで付着させるアプリケータヘッド」という構成の「同時」は、ある印刷ユニット内において版胴、ゴム胴に対して同時にという場合を包含していると認められるが、これは発明の詳細な説明に記載されていない技術的事項と認められる。

よって、請求項１に係る発明は、発明の詳細な説明に記載したものでない。

２．この出願は、特許請求の範囲の記載が下記の点で、特許法第３６条第６項

続葉有

部長	審査長	審査官	審査官補
	青木　和夫	青木　和夫	
	７１１９	７１１９	

Reason for Rejection

続　葉

第２号に規定する要件を満たしていない。

記

請求項１８における「水性又は紫外線硬化性印刷インキマニホルド湖はコーティング材料」の「印刷インキマニホルド湖」は、意味が不明瞭であるし、発明の詳細な説明中においても関連する記載が認められない。

よって、請求項１８に係る発明は明確でない。

この拒絶理由通知書中で指摘した請求項以外の請求項に係る発明については、現時点では、拒絶の理由を発見しない。拒絶の理由を新たに発見された場合には拒絶の理由が通知される。

先行技術文献調査結果の記録

・調査した分野　　ＩＰＣ第６版
　　　　　　　　　Ｂ４１Ｆ３１／１４、３１／３０、１３／００、２３／０８
　　　　　　　　　ＤＢ名
・先行技術文献
　特開昭６３－６２７３３号公報

この先行技術文献調査結果の記録は、拒絶理由を構成するものではない。

この拒絶理由通知書の内容に関する質問等がある場合は下記まで連絡して下さい。
審査第２部事務機器　TEL 03(3581)1101 内線3221～3223

【書類名】　手続補正書
【提出日】　平成10年10月27日
【あて先】　特許庁長官　殿
【事件の表示】
　【出願番号】　平成 8年特許願第146371号
【補正をする者】
　【事件との関係】　特許出願人
　【識別番号】　593102714
　【氏名又は名称】　ハワード　ウォーレン　デムーア
【代理人】
　【識別番号】　100088454
　【弁理士】
　【氏名又は名称】　加藤　紘一郎
　【電話番号】　0797-38-3240
【手続補正　1】
　【補正対象書類名】　明細書
　【補正対象項目名】　特許請求の範囲
　【補正方法】　変更
　【補正の内容】　1
【手続補正　2】
　【補正対象書類名】　明細書
　【補正対象項目名】　００３０
　【補正方法】　変更
　【補正の内容】　6

【特許請求の範囲】

【請求項１】 版胴、ゴム胴及び圧胴が回転自在に取り付けられた印刷ユニットを備えた形式の印刷機に用いられるインキング／コーティング装置において、インキング／コーティング装置が版胴及びゴム胴に対して作動位置にあるときに、インキとコーティング材料を、版胴に取り付けられた版とゴム胴に取り付けられたブランケットに選択的に付着させるアプリケータヘッドと、アプリケータヘッドを、アプリケータヘッドが版胴及びゴム胴に横方向に隣接して配置された作動位置に移動させたり、アプリケータヘッドを、アプリケータヘッドが版胴及びゴム胴に対して高い位置にある引込み位置に移動させるキャリジ組立体とを有することを特徴とするインキング／コーティング装置。

【請求項２】 キャリジ組立体は、印刷ユニットに回動自在に取り付けられるよう構成された第１の端部及びアプリケータヘッドに回動自在に結合された第２の端部を備えた支持アームを有し、アプリケータヘッドは、支持アームで支えられた状態で作動位置に移動できることを特徴とする請求項１記載のインキング／コーティング装置。

【請求項３】 バランスウェイトは、キャリジ組立体に結合されていることを特徴とする請求項１記載のインキング／コーティング装置。

【請求項４】 アプリケータヘッドは、インキ又は液状コーティング材料を受け入れるリザーバを備えたドクターブレード組立体と、リザーバと連通状態でドクターブレード組立体に結合されたアプリケータローラとを有し、アプリケータローラは、アプリケータヘッドが作動位置にあるときに、版胴に取り付けられた版又はゴム胴に取り付けられたブランケットに係合できることを特徴とする請求項１記載のインキング／コーティング装置。

【請求項５】 アプリケータローラは、弾性移送面を備えたアニロックスローラであることを特徴とする請求項４記載のインキング／コーティング装置。

【請求項６】 アプリケータヘッドに可動に結合されていて、伸縮自在な動力伝達アームを備えた動力アクチュエータと、動力伝達アームに結合されていて、動力伝達アームの伸縮運動をキャリジ組立体に対するアプリケータヘッドの回動運動に変換する運動変換装置とを有することを特徴とする請求項１記載のイン

キング／コーティング装置。

【請求項７】　運動変換装置は、動力伝達アームに結合された第１の端部及びアプリケータヘッドに固定された停止部材に係合する第２の端部を備えたベルクランクプレートと、キャリジ組立体に固定されていてベルクランクプレートに回動自在に結合されたクレビスプレートとを含むことを特徴とする請求項６記載のインキング／コーティング装置。

【請求項８】　アプリケータヘッドは、キャリジ組立体に回動自在に結合された第１及び第２のサイドフレーム部材と、第１及び第２のサイドフレーム部材に取り付けられていて、インキ又は液状コーティング材料を受け入れるリザーバを含むドクターブレード組立体と、第１及び第２のサイドフレーム部材にそれぞれ取り付けられたクレードル組立体と、クレードル組立体に回転自在に取り付けられると共にドクターブレード組立体に結合されていて、転動しながらリザーバ内のインキ又はコーティング材料と接触し、アプリケータヘッドが作動位置にあるとき、版胴に取り付けられた版又はゴム胴に取り付けられたブランケットに係合できるアプリケータローラと、アプリケータローラに結合されていて、アプリケータローラを回転させる駆動モータとを有することを特徴とする請求項１記載のインキング／コーティング装置。

【請求項９】　クレードル組立体は、第１及び第２のサイドフレーム部材にそれぞれ設けられた第１及び第２のソケットを有し、アプリケータローラは、第１及び第２のソケットに回転自在に取り付けられていることを特徴とする請求項８記載のインキング／コーティング装置。

【請求項１０】　クレードル組立体は、第１及び第２のサイドフレーム部材にそれぞれ設けられた第１及び第２のソケットと、第１及び第２のサイドフレーム部材にそれぞれ設けられた第３及び第４のソケットとを有し、アプリケータローラは、アプリケータヘッドが作動位置にあるとき、インキ又はコーティング材料を版又はブランケットのいずれかに付着させるよう第１及び第２のソケット又は第３及び第４のソケットのいずれかに回転自在に選択的に取り付けることができることを特徴とする請求項８記載のインキング／コーティング装置。

【請求項１１】　アプリケータヘッドは、インキング／コーティング装置が

作動位置にあるとき、版に係合できるようアプリケータローラを支持する第１のクレードルと、インキング／コーティング装置が作動位置にあるとき、ブランケットに係合できるようアプリケータローラを支持する第２のクレードルとを有することを特徴とする請求項１記載のインキング／コーティング装置。

【請求項１２】 キャリジ組立体は、印刷ユニットに回動自在に結合された第１の端部、及び第２の端部を備えた支持アームと、支持アームの第２の端部及びインキング／コーティング装置が回動自在に取り付けられた共通のピボットシャフトと、共通ピボットシャフトと印刷ユニットとの間に結合された雄型及び雌型ラッチ部材とを有し、ラッチ部材のうち一方は、共通ピボットシャフトに固定され、他方のラッチ部材は、印刷ユニットに取付け自在に構成され、ラッチ部材は、アプリケータヘッドが作動位置にあるときに、インターロック係合状態で相互に嵌合できることを特徴とする請求項１記載のインキング／コーティング装置。

【請求項１３】 アプリケータヘッド及び印刷ユニットは、キャリジ組立体及び印刷ユニットに取り付けられていて、アプリケータヘッドが作動位置にあるときに、キャリジ組立体を印刷ユニットに対してインターロック係合状態に解除自在に係止する雄型及び雌型ラッチ結合部材を有することを特徴とする請求項１記載のインキング／コーティング装置。

【請求項１４】 キャリジ組立体は、細長いシャンク部分及びハブ部分を有し、細長いシャンク部分は、アプリケータヘッドに回動自在に結合され、ハブ部分は、印刷ユニットに回動自在に取り付けられるよう構成されていることを特徴とする請求項１記載のインキング／コーティング装置。

【請求項１５】 第１及び第２の印刷ユニットを有するオフセット輪転印刷機であって、請求項１記載のインキング／コーティング装置が請求項１に記載されているように第１の印刷ユニットに可動に結合されていて、第１の印刷ユニットの圧胴に隣接して第１の印刷ユニットに取り付けられていて、印刷されたばかりの基材が圧胴と接触しているときに、加熱空気を送風して印刷基材に当てる乾燥装置を有することを特徴とするオフセット輪転印刷機。

【請求項１６】 高温空気、水分及び揮発分を乾燥装置と印刷基材との間の

暴露域から除去するためのエキストラクタが、乾燥装置に隣接して配置されていることを特徴とする請求項１５記載のオフセット輪転印刷機。

【請求項１７】 中間渡し胴が、第１の印刷ユニットの圧胴と枚葉紙移送関係をなして結合され、インターステーション乾燥装置が、中間渡し胴に隣接して配置されていて、印刷又は被覆が施されたばかりの基材を第１の印刷ユニットの圧胴から移送したあとであって、中間渡し胴と接触しているときに、加熱空気を送風して基材に当てるようになっていることを特徴とする請求項１５記載のオフセット輪転印刷機。

【請求項１８】 第１及び第２のオフセット輪転印刷ユニットを含む形式の印刷機で、少なくとも第１の印刷ユニットの作動中に水性又は紫外線硬化性印刷インキ又はコーティング材料を用いてオフセット輪転印刷をする方法において、版を水性インキ／水性コーティング材料又は紫外線硬化性インキ／紫外線硬化性コーティング材料によりスポット又はオーバーオール状態でコーティングし、ブランケットを水性インキ／水性コーティング材料又は紫外線硬化性インキ／紫外線硬化性コーティング材料によりスポット状態であると共に、或いはオーバーオール状態でコーティングし、印刷インキ又はコーティング材料を印刷版からブランケットに転移し、基材が圧胴とブランケットとの間のニップを通って移送されているときに、インキング又はコーティングされた画線をブランケットから基材に転移し、基材が次の処理を施される前に、印刷基材上のインキ又はコーティング材料を乾燥させ、上記工程を各印刷ユニットで連続して実施することを特徴とするオフセット輪転印刷方法。

【請求項１９】 乾燥工程では、印刷／被覆が施されたばかりの基材が第１の印刷ユニットの圧胴と接触しているときに高速加熱空気を送風して基材に当てることを特徴とする請求項１８記載のオフセット輪転印刷方法。

【請求項２０】 印刷基材を第１の印刷ユニットから中間渡し胴に移送し、印刷基材が中間渡し胴と接触しているときに印刷基材を乾燥させることを特徴とする請求項１８記載のオフセット輪転印刷方法。

【請求項２１】 印刷／被覆が施されたばかりの基材が圧胴と接触しているときに基材上の暴露域から高温空気、水分及び揮発分を除去することを特徴とす

る請求項１８記載のオフセット輪転印刷方法。

【請求項２２】 水性コーティング材料又は紫外線硬化性コーティング材料のプライマーコーティングを第１の印刷ユニット内で基材に施し、基材が第２の印刷ユニット内で処理される前に、基材上のプライマーコーティングを乾燥させることを特徴とする請求項１８記載のオフセット輪転印刷方法。

【００３０】

版Ｐが刷りを行うと、動力が空気圧アクチュエータ１０４に及ぼされ、動力伝達アーム１０４Ａが引っ込み、かくしてベルクランク１１１がピン１１３の回りに反時計方向に回転する。空気圧アクチュエータ１０４によって及ぼされたトルクは、カムローラ１１７及び可調式停止部材１１９を介してアプリケータヘッド６０に伝達される。支持シャフト７７に対するアプリケータヘッド６０の反時計回りの動作により、アプリケータローラ６６は版Ｐと係合するようになる。

【書類名】　意見書

【提出日】　平成10年10月27日

【あて先】　特許庁審査官　青木　和夫　殿

【事件の表示】

【出願番号】　平成 8年特許願第146371号

【特許出願人】

【識別番号】　593102714

【氏名又は名称】　ハワード　ウォーレン　デムーア

【代理人】

【識別番号】　100088454

【弁理士】

【氏名又は名称】　加藤　紘一郎

【電話番号】　0797-38-3240

【発送番号】　084987

【意見の内容】　1

Argument

平成１０年６月３０日発送の拒絶理由通知書示された審査官の認定を検討し、本出願人は別途提出の手続補正書において特許請求の範囲を補正していますので、補正事項に基づいて再度の審査をお願いします。そこで、補正の内容を簡単に説明します。

理由１に関し、明細書における開示内容では、図３及び図４に示されたデュアルクレードル構成（７８，８０；８２，８４）は、アプリケータヘッド６０がインキとコーティング材料を版Ｐとブランケット Ｂに選択的に付着させるようになっています。そこで、このように請求項１の内容を補正しました

理由２に関し、これは単なる誤記であります。

さらに、明細書を検討し、誤記の存在が判明しましたので、手続補正２において誤記の訂正を行っています。

以上

特許査定

特許出願の番号	平成 8年 特許願 第１４６３７１号
起案日	平成１１年 1月 8日
特許庁審査官	青木 和夫　　　　７１１９ ２Ｃ００
発明の名称	印刷ユニット相互間でフェリス運動をする引込み自在なインキング／コーティング装置
請求項の数	２２
特許出願人	ハワード ウォーレン デムーア
代理人	加藤 紘一郎　　　　(外 2名)

この出願については、拒絶の理由を発見しないから、特許査定する。

Decision for Patent

部長	審査長	審査官	審査官補	分類確定官
	青木 和夫	青木 和夫		青木 和夫
	７１１９	７１１９		７１１９